Establishing the Electric Range Throughout the Far West—
and Other Articles for the Sales Manager, Dealer, Contractor, Manufacturer and Engineer

Electrical World

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Weston

A Brief Story About Weston Instrument Transformers

A very serious problem confronted the Weston Company a few years ago, at the time it had perfected its now world-famous group of A. C. Switchboard Indicating Instruments.

The Company had developed these Instruments to the highest state of perfection, but unfortunately there were on the market no Transformers of sufficient accuracy and serviceability to use in combination with them. Exhaustive tests were made on all types of Transformers available in this market, and the Weston branches and representatives in foreign lands were commissioned to scour the field and send samples of the best Transformers procurable.

Not one of the Transformers thus obtained in this country or abroad even approximately met the requirements.

The Weston Company did not want to make Transformers, because of other work it deemed of greater importance; but failing to find Transformers that it could recommend to be used in conjunction with Weston Instruments with assurance of accuracy better than 1 per cent for the combination, it endeavored to have them built to special designs. Even then the results were far from satisfactory.

Realizing finally that the problem of Instrument Transformers was one that must be solved as other Weston problems had been solved, the Weston Engineering Staff thoroughly analyzed the subject and completed designs for various groups of Portable and Switchboard types of Current and Potential Transformers of a degree of accuracy and serviceability that completely met the practical requirements of switchboard practice and precision determinations in the laboratory.

These Weston Transformers established a new standard for Instrument Transformer design and construction.

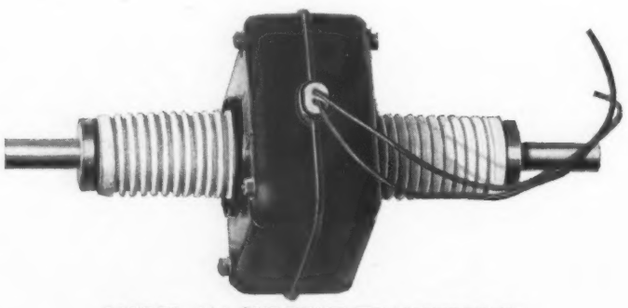
As might have been prophesied, the improvements made by the Weston Company resulted in improvements on the part of other instrument manufacturers, and this is one more instance of apparatus remaining stationary, so far as merit was concerned, until a Weston type blazed the way for betterments. The significance of this is apparent.

Model 312

PORTABLE INSTRUMENT TRANSFORMER

Weston Switchboard Instrument Transformers described in Bulletin 1501.

Weston Portable Instrument Transformers described in Bulletin 2001.



MODEL 365 CURRENT TRANSFORMER
For Use on 13,200 Volt Circuits.

Home Office and Factory
13 Weston Ave., Newark, N.J.

New York	Chicago
Boston	Detroit
Philadelphia	Toronto
Buffalo	Montreal
Richmond	Winnipeg
Cincinnati	Vancouver
Cleveland	Berlin
Pittsburg	London
St. Louis	Florence
Denver	Paris
San Francisco	Petrograd

Johannesburg, S. Africa

Weston Electrical Instrument Co.

Electrical World

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Preparing for the Chicago Convention

ONE of the great conventions of the year is to be held in Chicago May 20-26. The program of this thirty-ninth meeting of the National Electric Light Association includes nearly 100 papers. In some cases four parallel sessions must be held. A national convention always represents a tremendous amount of work. Committees and members who prepare reports and papers present the results of weeks of effort. The growth of the industry each year makes it necessary constantly to broaden the papers presented. This increase in the subjects to be covered presents a problem to the association which must sooner or later be solved. Undoubtedly at present much of the work of preparation of papers is lost. Men cannot be in three or four sessions at the same time, and in spite of the admirable work of the program makers the needs of all attending are difficult to meet. A broad survey of the convention as a whole must be made. This the editors of this journal conceive as one of its functions, and in the pre-convention number and in the report number the ELECTRICAL WORLD will, as usual, summarize the purposes of the association and present abstracts and discussions of the papers as a whole not only for the benefit of those who will attend but for the much larger proportion of those in the industry who cannot.

"Movie" Engineering

BOTH the projecting apparatus and the screen in the moving picture theater offer possibilities for engineering service which the local central station company may render the theater company with mutual profit. The moving picture business is now as well established as electric sign and display lighting. Flicker and unsteadiness due to various causes were early defects in projecting apparatus. Holes in the films were a contributing cause, unsteadiness of the projecting machine on its foundation another. Imperfect adjustment of shutter and film operating mechanism was another. While not electrical, these defects may be looked for by the central station engineer.

On the electrical side the use of alternating-current arcs has been at the bottom of many unsatisfactory results. With a direct-current arc there is a very definite principal source of light, namely, the crater on the positive carbon. This is near enough to a point source to allow of definite focusing and leave little question in the mind of the operator as to when the best focus has been obtained. With the alternating-current arc there are three sources of light to confuse the operator, the upper carbon, the lower carbon and the flame of the arc. The light as projected on the screen is principally that coming from one of the carbons, and the quantity of light projected on the screen with a given wattage at the arc is obviously much less than with direct current. To this is added the difficulty of focusing and the alternations of the arc itself and there is plenty of cause for unsatisfactory pictures. Where there is alternating-current supply practice is now gradually settling to the use of motor-generator sets and a greater volume of current at the arc than formerly. Where 15 amp. or 20 amp. was formerly used, 30 to 40 is now used and some of the larger theaters are using 50 to 60. It is found that inasmuch as some films are rather dense these higher current values are advisable to give a clear picture with some films, but it is not necessary with all. There is room for much work in the standardization of film densities so that films as produced will be more uniform, but with conditions existing as they are the moving picture operator must be prepared to take what may come in the way of films.

With the arc in proper focus and the machine properly adjusted a fairly uniform beam of light is directed to the screen. The next step to analyze is the reflection from the screen. There is room for considerable difference of opinion even among experts as to what type of screen is best. There are two general types in use although they go under various names. One is a matte (not glossy), white surface painted or calcimined on a cloth or plaster background. The other is a surface coated with aluminum paint or its equivalent, or a ground-glass mirror. Illuminating engineers who are familiar with the characteristics of different reflecting surfaces will recognize that a matte surface if sufficiently rough will present an almost equal brightness in all directions from which it is likely to be viewed by an audience, as it approaches a perfectly diffuse reflecting surface. The aluminum finish or ground-glass mirror, on the other hand, will appear much brighter to those sitting directly in front of the screen than to those far to one side. If it is assumed that all of the audience is seated within a range of 30 deg. each side of the center line of the screen, as is sometimes the case in long, narrow theaters, the aluminum type of screen will give a much higher average brightness and therefore greater effects for the electrical energy expended. This, however, does not tell the whole story. The aluminum type of screen is very much brighter in some spots than in others, due to the effects of partially specular reflection. Although this difference in brightness is not apparent while pictures are being shown and can only be seen when the screen is unobstructed by a picture, it is nev-

ertheless probable that it does really interfere somewhat with the seeing of the picture to the best advantage, as the effect is somewhat akin to that of glare from paper with which all are familiar. For practical purposes, therefore, fully as satisfactory results are likely to be attained with the matte surfaced screen as with the aluminum type which gives a greater brightness. The matte surface has the advantage of cheapness and ease of renewal as it is simply a case of applying another coat of white calcimine or matte surface paint to maintain the screen surface clean and white and at a high state of efficiency.

Interdependence of Industrial Operation and Motor Drives

PRODUCTION in the modern plant is carried out, as far as possible, as a continuous operation. One stage of production feeds the next, and the plant and its equipment are designed to facilitate this smooth flow of work. The application of power to machines is a most important factor if breakdowns and stoppage which hold up production are to be prevented. Typical of this development is the factory of the Crane Company in Chicago, the electrical equipment for which is described elsewhere in this issue. The engineering at the Crane plant is most suggestive as showing how the electric drive lends itself to the requirements of continuous production. For the mechanical operation of this plant more than 600 motors are already installed, varying from 5 hp. to 50 hp., and applied to every conceivable mechanical purpose afforded by the necessities of pipe, valve and fitting manufacture, to say nothing of the operation of elevators and motor trucks. A few years ago such a plant would probably have taken chances with a generating station of its own. In this case, however, central-station service is supplied by the Commonwealth Edison Company from an industrial feeder loop so connected with its generating stations that power at the Crane plant may be taken from three independent sources. At the factory a group of substations has been planned, one for each section of buildings, and each unit substation constitutes a control station for all the motors in the section.

All the high-tension lines are carried underground in cement conduits, which are also used for the branch runs. Of the substations installed each is composed of two parts, a transformer room and a switchboard room. The first is outside of the main building in a separate structure and contains the high-tension transformers and their switch equipment. Inside the main building is the room containing the power and lighting switchboard and the motor generator sets for direct current. Protection against interruption of service, so necessary to continuity of operation, is carried exceptionally far. Each transformer room has a double bank of transformers. Each bank delivers energy to its own bus on the switchboard, and the two are normally in parallel, but if any transformer fails the bank can be thrown out from the switchboard room, leaving the whole motor service on the uninjured bank, which is proportioned with the idea of carrying the entire load until there is time to find the injured transformer, cut it out and operate the bank on the open instead of the closed delta connection.

Continuity of service governs the motor system as well. No fuses are employed. Every motor, even to the smallest, is fitted with overload and no-voltage release switches for the purpose of avoiding the loss of the time necessary to replacing fuses, and each motor is operated on its own conduit running back to the power switchboard in the substation where these protective devices are installed. Indicator lamps and an alarm bell give immediate notice to tell the operator when the circuit breaker goes out and its location on the substation switchboard for speedy operation. Such an arrangement means considerable added cost in wiring, but steady operation is so necessary to the efficient operation of the whole works that the expense is extremely well worth while. As a still further precaution the main supply panels to the motor circuits are provided with a shunt trip on each leg of the circuit, so that if for any reason one leg goes out it will be followed by the others, thus preventing any of the motors from running single phase.

This installation serves, as a whole, to emphasize the interdependence of the factory production problem and the industrial electrical engineering problem. As demands for refinements in industrial operation are pressed home to the manufacturer, the electrical engineer in the industrial plant finds that the electric drive is more and more a necessary factor in the correct solution of the broader problem of increasing output. He must study the industrial problem to apply the electric drive most efficiently.

Popularizing Cooking by Wire

TO increase the market for electrical energy, the central station companies on the Pacific Coast have educated their customers widely as to the convenience and serviceability of socket appliances of all sorts. The Pacific field of activity may be said to be a national testing ground for the extensive development of this class of business. The natural conditions of climate as well as the availability of considerable extra capacity for energy, make it possible to introduce heating appliances under very favorable conditions. The extensive development of the electric range on the Pacific Coast, outlined on another page, has aroused the interest of central stations in all sections of the country. While the conditions on the Atlantic Coast and in the intervening sections between ocean borders are different from those on the Pacific Coast, the Western Coast development has many suggestive features for any locality. Experience on the Coast indicates that the central station is, at the start at least, the primary distributor of ranges.

The first cost of the electric range makes it necessary in general to sell them on a part-time plan and this brings in questions of financing which the central station is in a better position to take up than other

distributors. Experience on the Coast indicates also that follow-up service must constitute a part of a sales policy, and in this the central station on the Coast has taken the initiative. It has proved profitable to canvass apartment houses and residences for electric-range wiring, and to supply domestic science and home economics departments in high schools and colleges with electric literature. The slogan "Cook by Wire" has been effectively used in advertising campaigns.

While Western climate conditions and the scarcity of coal and gas affect favorably the market for electric ranges, the enthusiasm of the customers indicates that fundamentally the electric range is not a local but a national means of widening the use of electricity. Electric ranges in the average residence in the West have increased the income to the central station per customer from $21 to $60 per year. Twenty-six Western central stations announced last fall that they would purchase 5000 electric ranges, and one observer believes that it will be surprising if the number proves equal to the demand.

Central stations are anxiously looking forward to the time when dealers will be properly equipped to handle all merchandising for them, but they cannot neglect the opportunity to increase their business, and therefore, with respect to ranges and similar devices, will probably have to do the merchandising themselves for some years to come. Manufacturers should recognize this condition and should assist the central stations in this pioneer work until the time has arrived when the dealers and jobbers can take over this class of merchandise.

Measuring Radiant Power

THE subject of radiant power is of very great importance, both from the scientific and the practical viewpoint. It is to studies of energy radiation and its laws that we must look for the greater part of our knowledge of the visible universe outside of this world's limits. Without abundant information concerning radiant energy, the destiny of our universe seems likely to be concealed from us. On the other hand, by dint of patient investigations into the laws and conditions of radiant energy, we may perhaps be able to comprehend more fully the mechanism of the universe. Is the whole system perpetually increasing in entropy, and losing energy by radiation, or is there a corresponding regeneration and re-energization going on somewhere?

From a practical viewpoint, the eye responds to radiant power stimuli over about one octave only of impressed frequency. In producing artificial light, the fundamental problem is to transform power from other forms into radiant power within this octave with the maximum practicable efficiency, convenience and simplicity. The theoretical efficiency of such a process has no necessary limit short of 100 per cent. The highest attainable efficiency is still in units per cent.

Moreover, our measurements of visual acuity and of color visibility are still so imperfect that we have no means of knowing how the average human eye of to-day compares with the average human eye among the ancient Greeks or Romans. We are only just beginning to accumulate data from which it may be possible for posterity to draw reasonably accurate comparisons of this kind, starting from the average eye of the present time.

For the above, and for various other reasons, it is evident that improvements in means for the measurement of radiant power are very welcome. The Stefan law of total power radiation is that a hot black body radiates as the fourth power of its absolute temperature, following a radiation constant sometimes called Stefan's coefficient, which gives the radiated power per square centimeter and degree absolute or Kelvin. This constant, in C. G. S. measure, is taken to lie between 5×10^{-5} and 6×10^{-5} abwatts per square centimeter and degree Kelvin.

A recent paper by Messrs. W. W. Coblentz and W. B. Emerson, published by the Bureau of Standards, describes a lengthy research upon a radiant-power measuring device, and the value of the radiation constant as obtained therewith. The paper is referred to in this week's digest. The device appears to be very simple, and yet to have very appreciable advantages. It consists essentially of a very thin blackened metallic strip, which receives the radiant power on its face, and becoming warm thereby radiates in turn upon a sensitive thermopile supported behind it. This thermopile affects a sensitive galvanometer in its circuit. When the incident radiant power has been shut off a measured electric current can be passed through the strip from a local voltaic source, so as to reproduce the galvanometer deflection from a measured amount of radiant power emitted voltaically in the strip.

Results obtained with thirteen different strip receivers gave a value for the radiation constant in C. G. S. measure between 5.53×10^{-5} and 5.96×10^{-5}. We hope that these researches may be continued and also be extended, so as to enable the value of this important radiation constant to be accepted internationally to a precision of one per mil.

The Coming Issues

THE issue now in the hands of the reader is the commercial number for April—the fourth issue of the month, which is regularly given over largely to commercial topics and articles bearing upon the work of extending the applications and use of electricity. In next week's issue, in addition to a timely discussion of the water-power situation, there will be articles on the New York Edison Company's educational courses for training its commercial, technical and accounting employees; successful campaigns for electric-range business; a novel plan for renewals of customers' lamps on a purchase basis; and other topics of interest to the central-station operator, the engineer and the electrical business man. The first number of May will be the public relations issue of that month.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

Indiana New-Business Managers Meet

Discuss Electric Cooking and Profitableness of Rural Business at Their First Convention Held at Kokomo

With "co-operation" as his keynote O. M. Booher of the Indiana Railways & Light Company opened the first convention of the New-Business Managers' of the Indiana Electric Light Association at Kokomo on April 19.

By far the liveliest and most interesting discussion of the day ensued after the presenting of the subject of "electric cooking" by Mr. Miles.

ELECTRIC COOKING

In his paper on "Electric Cooking" Pierre L. Miles, sales manager, Globe Stove & Range Company, Kokomo, Ind., reviewed the subject of the electric range and the effect of low rates on electric-cooking business, and discussed the advisability of including the installation charge in the list price; the efficacy of time payments, the appeal of trial installations of ranges, the maintenance of prices, and plans for campaigns. Seventy-seven towns in Indiana, said Mr. Miles, now have a cooking rate of 5 cents or less per kilowatt-hour.

While the representatives who were rather in doubt as to the advisability of a range load mentioned the inadequate condition of present lines and the changes necessary properly to care for this new business, the boosters of electric cooking, and especially R. A. MacGregor, sales manager of the Merchants' Heat & Light Company of Indianapolis, advocated electric range business as an off-peak load and an opportunity for profits which the central-station could not afford to overlook.

As an evidence of this Mr. MacGregor mentioned the half-dozen gas-range manufacturers who have turned to making electric ranges within the last few years.

In reply to the item of the first cost of ranges, it was brought out that the present high retail price of the stoves is the one consideration which will prevent immediate wholesale adoption by an inexperienced public of an article which is not understood, and upon which the public could not secure instantaneous and satisfactory service from the central-station.

As a partial solution of the problem, the representatives were urged to adopt time payments, trial installations and full list prices in connection with a rate for service which would be low enough to secure the business and high enough to net a profit to the lighting company.

In view of the great interest displayed a special committee will be appointed to look into and report on the subject of "electric cooking," with a view to secure concerted action throughout the State to the profit of the central stations and the satisfaction of consumers and manufacturer.

THE COST OF RURAL BUSINESS

According to P. H. Palmer, assistant general manager of the Indiana Railways & Light Company, Kokomo, rural service cannot be looked upon as an established successful branch of the lighting and power business. Referring to conditions in his own territory he pointed out that the average investment required per rural consumer for line, transformers and service wires is $98.49, not including interest and depreciation. The extra cost of meter reading due to the distance between customers and the increased core loss of transformers due to lower load factor, brings the cost of serving rural customers to $8.65 more per year per consumer than for city customers, thus the business of the former should be $14.50 greater per rural consumer than for city customers if both are to be served on the same paying basis. Attention was also called to the fact that should the company undertake to cover rural territories with service the expense would be still greater since only the "cream" of the market is catered to at present.

During the discussion on the subject of rural extensions the prevailing opinions indicated that whenever this business has been gone into at all, the profits secured have not been in keeping with the expense items. A timely suggestion was advanced by Thomas Donahue of Lafayette that a careful official investigation be made of the cost of securing rural business with a view of preventing any venturesome company from blindly attempting to secure this business on a basis with which other companies might have to compete, and this to their detriment.

There were eighty representatives from all over the state present at the meeting, and the outlook for a successful and enthusiastic organization is exceedingly bright.

N. E. L. A. Convention Program

Sessions Will Extend Over Four Days and Over One Hundred Reports, Addresses and Papers Are Scheduled for Presentation

Below is given the tentative program of the work to be done at the Chicago convention, May 22-26, the first meeting being held on Tuesday, May 23. As usual, the program is subject to revision, but is not likely to be departed from except in one or two minor respects. At San Francisco, in 1915, the working sessions for various reasons were limited to three days—Tuesday, Wednesday and Thursday—but at Chicago this year, as at Philadelphia in 1914, there will be sessions on Friday morning, it being literally impossible to crowd all the work into three days. The program indicates that a large amount of important business now arranged carries over until Friday, to say nothing of what may possibly develop in the meantime. There are three special new features of the program this year. In the first place, three sessions are occupied by the new Electric Vehicle Section, and in the second place two are devoted to the new Company Section Committee which is doing splendid work in the development of this branch of association usefulness. The third item of change is that the Public Policy meeting will not be a big, spectacular affair this year, but an executive session, open only to Class A operating companies and their representatives, to discuss and determine the inner matters of management and outer aspects of relationship to regulatory bodies. It will be noted that there are many new items on the program evidencing the broader and newer conditions of the industry. A more attractive program was never presented to the membership than that which is given on the opposite page.

N. E. L. A. Chicago Convention Program

General and Executive Sessions

TUESDAY, MAY 23, 10 A. M.

1—Welcome to the city, Mayor Thompson.
2—Address of President Lloyd.
3—Announcements.
4—Report of committee on organization of the industry (membership), George Williams.
5—Report of the secretary, T. C. Martin.
6—Report of insurance expert, W. H. Blood, Jr.
7—Report of committee on progress, T. C. Martin.
8—Report on Question Box, S. A. Sewall.
9—Report of committee on relations with educational institutions, J. F. Gilchrist.
10—Report of committee on company sections, F. J. Arnold.

TUESDAY, MAY 23, 8.30 P. M.

1—Report of committee on public policy, W. W. Freeman.
2—Report of committee on taxation of public utilities, John A. Britton.

WEDNESDAY, MAY 24, 10 A. M.

1—Report of treasurer, W. H. Atkins.
2—Election of committee on nominations.
3—Report of committee on rate research, Alex Dow.
4—Report of committee on constitution and by-laws, R. S. Orr.
5—Report of committee on geographic sections, Louis D. Gibbs.
6—Address: "The Society for Electrical Development," J. M. Wakeman.

FRIDAY, MAY 26, 10 A. M.

1—Awarding Doherty, Williams and Frasse prizes.
2—Report of nominating committee.
3—Report of committee on president's address.
4—Report of committee on memorials.
5—Report of committee on resolutions.
6—Election and installation of officers; adjournment.

Technical and Hydroelectric Sessions

TUESDAY, MAY 23, 2.30 P. M.

1—Chairman's address, Holton H. Scott.
2—Report of committee on meters, C. G. Durfee.
3—Report of committee on electrical measurements, values and terminology, A. E. Kennelly.
4—Paper: "Lightning Protection for Transformers," D. W. Roper.

WEDNESDAY, MAY 24, 2.30 P. M.

1—Report of committee on underground construction, E. B. Meyer.
2—Report of committee on overhead line construction and inductive interference, R. J. McClelland.
3—Report of committee on hydro and transmission progress, T. C. Martin.

THURSDAY, MAY 25, 10 A. M.

1—Report of committee on accident prevention, Martin J. Insull.
2—Report of committee on prime movers, I. E. Moultrop.
3—Report of committee on electrical apparatus, L. L. Elden.

THURSDAY, MAY 25, 2.30 P. M.

1—Report of committee on street lighting, S. B. Way.
2—Report of committee on power supply for the electrification of steam railroads, Peter Junkersfeld.
3—Paper: "Central Station Electric Systems and Railroad Power," J. Darlington.

Commercial Sessions

TUESDAY, MAY 23, 2.30 P. M.

1—Chairman's address, J. F. Becker.
2—Report of committee on finance, E. A. Edkins.
3—Report of committee on membership, H. N. McConnell.
4—Report of committee of publications, C. A. Littlefield.
5—Report of committee on salesman's hand book, M. S. Seelman.
6—Report of committee on education of salesmen, F. R. Jenkins.
7—Paper: "The Way to Make a Salesman," Earl E. Whitehorne.
8—Report of committee on merchandising and recent developments in electrical appliances, W. G. Stetson.

WEDNESDAY, MAY 24, 10 A. M.

1—Report of committee on wiring, R. S. Hale.
2—Report of committee on lamps, Frank W. Smith.
3—Report of committee on electric ranges, W. R. Putnam.
4—Election of committee on nominations.

WEDNESDAY, MAY 24, 2.30 P. M.

1—Report of power sales bureau, C. J. Russell.
2—Paper: "Central Station Service in the Manufacture of Artificial Ice," C. J. Carlson.
3—Report of committee on new industrial applications of electricity, P. Torchio.
4—Report of industrial electric heating bureau, C. F. Hirshfeld.

THURSDAY, MAY 25, 10 A. M.

1—Report of lighting sales bureau, John G. Learned.
2—Report of committee on commercial aspects of highway and municipal lighting, T. F. Kelly.
3—Report of committee on industrial and yard lighting, Oliver R. Hogue.
4—Lecture: "Lighting—A By-Product or a Buy Product" (illustrated), William A. Durgin.

THURSDAY, MAY 25, 2.30 P. M.

1—Paper: "Temporary Service for Municipal Sub-Service and Other Construction," C. K. Nichols.
2—Paper: "The Resistance Heater as a Load Builder," E. F. Collins.
3—Paper: "Electric Furnaces," R. H. Tillman.
4—Paper: "Electric Welding," S. R. Dresser.
5—Report of committee on competitive power sources, E. F. Tweedy.

FRIDAY, MAY 26, 10 A. M.

1—Report of committee on residence lighting, Fred H. Scheel.
2—Report of committee on stores and public buildings, S. B. Burrows.
3—Report of committee on electrical advertising, A. K. King.
4—Election and installation of officers; adjournment.

Accounting Sessions

TUESDAY, MAY 23, 2.30 P. M.

1—Chairman's address, H. M. Edwards.
2—Election of nominating committee.
3—Report of executive committee.
4—Report of membership committee, E. J. Allegaert.
5—Report of committee on classification of accounts, William Schmidt, Jr.
6—Report of committee on cost accounting and statistics, T. J. Walsh.
7—Report of the library committee, Alex Holme.

WEDNESDAY, MAY 24, 10 A. M.

1—Report of committee on form of annual report, C. H. Hodskinson.
2—Report of committee on customers' records, E. J. Fowler.
3—Report of committee on purchasing and storeroom accounting, H. F. Frasse.

THURSDAY, MAY 25, 10 A. M.

1—Paper: "Correspondence Course in Accounting," A. L. Holme and J. R. Wildman.
2—Report of committee on Question Box, Edwin A. Barrows.
3—Open discussion and experience meeting.
4—Report of committee on nominations.
5—Election and installation of officers; adjournment.

Electric Vehicle Sessions

WEDNESDAY, MAY 24, 10 A. M.

1—Address of chairman, Walter H. Johnson.
2—Report of secretary, A. Jackson Marshall.
3—Report of treasurer, H. M. Edwards.
4—Report on section activities, Secretary Marshall.
5—Report of committee on membership, Joseph D. Israel.
6—Report of committee on standardization, E. R. Whitney.
7—Report of committee on motion picture films, Carl H. Reed.
8—Report of committee on traffic and good roads, A. H. Manwaring.
9—Report of committee on insurance, Day Baker.
10—Election of nominating committee.

WEDNESDAY, MAY 24, 2.30 P. M.

1—Report of committee on garages and rates, George B. Foster.
2—Report of committee on legislation, P. D. Wagoner.
3—Report of committee on federal and municipal transportation, James H. McGraw.
4—Paper: "Industrial Truck Applications," C. W. Squires.
5—Paper: "Electric Truck Problems and How to Minimize Them," F. E. Whitney.
6—Paper: "The Relations of Tires to Electric Vehicle Efficiency," S. N. Norton.
7—Paper: "Greater Garage Service," Harry Salvat.

THURSDAY, MAY 25, 10 A. M.

1—Report of committee on operating records, W. P. Kennedy.
2—Report of committee on central station co-operation, E. S. Mansfield.
3—Paper: "The Exchange Battery System," P. D. Wagoner.
4—Paper: "Passenger Vehicle Problems and Activities," E. P. Chalfant.
5—Paper: "Central Station Promotion of Electric Vehicle Use," W. P. Kennedy.
6—Report of committee on nominations.
7—Election and installation of officers; adjournment.

Company Sections Sessions

THURSDAY, MAY 25, 2.30 P. M.

1—Paper: "The Company Section and the Company," M. S. Seelman, Jr.
2—Paper: "Financing Company Sections," A. L. Atmore.
3—Paper: "Company Section Educational Work," Douglass Burnett.
4—Paper: "Company Section Entertainment and Recreation," A. D. Bailey.

FRIDAY, MAY 26, 10 A. M.

1—Paper: "Employees' Activities: Should They All Be Under the Auspices of the N. E. L. A. Company Section," J. D. Israel.
2—Formation and methods of conducting company sections, E. C. Stone.
3—Suggestions by committee on company sections, F. J. Arnold; adjournment.

Conference on Safety to Be Held in Chicago

According to the latest plans of the Bureau of Standards, a conference on the operating and safety rules to be promulgated by the government through the Bureau of Standards will be held in Chicago immediately after the convention of the National Electric Light Association. While no definite dates have as yet been assigned, the probabilities are that the conference will be held on Friday and Saturday of convention week or on the Monday and Tuesday following the convention. It is expected that this will be the final conference on these rules and regulation, which will thereafter be printed and circulated throughout the country. The representatives of the Bureau of Standards were in session with committees of the National Electric Light Association at the Engineering Societies Building, New York, on Tuesday of this week.

Municipal Ownership Defeated in Illinois

Bond issues to provide funds for erecting competing municipally-owned plants in two Illinois cities were defeated at the polls on April 18. At Danville the municipal ownership measure authorizing the issue of $200,000 in bonds to erect a street lighting plant was defeated by a vote of three to one. The Danville Street Railway & Light Company, one of the properties of the Illinois traction system, in combatting the municipal ownership campaign conducted no public demonstrations, but by a series of straightforward business letters to its patrons explained what a bond issue of $200,000 meant to each individual in increased taxes. A citizens' league was also formed to combat the municipal ownership propaganda.

At Whitehall, a city of 3000 inhabitants, in the territory served by the lines of the Central Illinois Public Service Company, the municipal ownership measure was defeated by a comfortable majority. The methods employed by the central-station company there to defeat the measure were similar in nature to those used at Danville, except that an audience of 700 people was assembled one evening just prior to the election to listen to a statement of facts in the municipal ownership case which was given as a part of a free program including a band concert and a few reels of motion pictures.

Courses in Utility Management at Harvard

Local public utility operation has been made the subject of a course in business management at the Harvard Graduate School of Business Administration at Cambridge. During April the subjects presented in the course include relations with contractors and supply companies and a study of selected advertising campaigns. "The Gas Residual Problem," presented by Everett F. Gray, Lowell Gas Light Company, Lowell, Mass.; "New Business Analysis," by John West of Charles H. Tenny & Company, Boston; "The Small Consumer—the Fostering of Good-Will," by E. W. Lloyd, Commonwealth Edison Company, Chicago; "Advertising," by Louis D. Gibbs, Boston Edison Company, Boston, have been presented. Accounting systems in use by gas and electric companies will also be taken up.

The course on public utilities operation is at present given as a part course in the second half of the first year and the first half of the second year of the complete two-year course of the school. The catalog states that "the purpose of the course is to train men for ultimate executive positions in the local utility companies by offering specialized instruction and giving a broad point of view in this particular field."

The catalog further states that "Previous engineering training is of value but is not a requirement to this course, which is open to all students (at the school) who have satisfactorily completed the first year course in factory management or its equivalent.

Finest Family Hotel in Middle West to Do Baking Electrically

The fashionable new Edgewater Beach Hotel, under construction on the North Side in Chicago, which is to be the finest family hotel in the Middle West, will be equipped with electric ovens, and all baking of food for the hotel use will be done electrically. The hotel will also be provided with electrically heated service carts for aftr-theater parties. These will contain hot and cold compartments for carrying hot and cold food specials, and when not in use for serving they will be connected to the nearest socket and the food kept hot. The cold-food compartment on the same carts is kept iced. The Hughes Electric Heating Company was awarded the contract for the entire baking equipment.

For a National Electric Range Campaign

Society for Electric Development Inaugurates Movement to Educate Both Industry and Public on Electric Cooking Subjects—Data on 2810 Cooking Rates now Available

Representatives of leading electric and other electrical interests were present at a special meeting held in the offices of the Society for Electrical Development, Inc., New York City, April 14, to consider the undertaking of a national electric-range campaign, within the industry itself as well as with respect to directing public attention to the advantages of electric cooking. The meeting was preliminary to the appointment of a national electric-range committee composed of representatives of all electrical interests. It is recognized that the attention of the industry is being focused upon the desirability of the electric range as a means of building up the domestic load. Several manufacturers are contemplating big campaigns to promote electric-range sales, and it was reasoned that the Society for Electrical Development would be the best organization to act as a clearing house for the campaign, as it did the "Wire-Your-Home" Month movement which has just come to a successful close.

A function of the society in the proposed campaign would be to lend support to central stations by giving them specific data on the desirability of the range business and to aid them in conducting range campaigns. Sales arguments for range salesmen to use could be standardized as much as possible and then published in book form to be used by the individual salesman. It was also proposed that the society issue a booklet on how to put on a range campaign. In the work of developing the public demand for electric cooking the society would aid by disseminating advertising and publicity matter through its various channels. During the discussion of sales methods considerable stress was laid upon the suggestion that central stations include the cost of installation in their range prices.

Nearly 2800 Communities Have Cooking Rate of 5 Cents or Less

Data collected by the society from 2769 communities in the United States and Canada where an energy rate of 5 cents or less per kilowatt-hour is offered for electric cooking was also presented during the discussion

of cooking costs with electric ranges. In all, some 2810 schedules, involving rates of 5 cents or lower per kilowatt-hour, have been reported. As forty-one of the communities above mentioned have two rates, the actual number of the communities in which 5-cent (or lower) cooking rates are available is, as above stated, 2769.

Of the 2810 rates reported, those equivalent to 5 cents per kilowatt-hour or less, but more than 4.5 cents, number 705; those from 4.5 cents to 4 cents number 144; 4 to 3.5 cents, 923; 3.5 to 3 cents, 258; 3 to 2.5 cents, 661; 2.5 to 2 cents, fifty-eight, and less than 2 cents, sixty-one.

Figures obtained by the society also indicate that of 8500 electric ranges reported as now in service, less than 100 are in use at rates above 5 cents per kilowatt-hour.

A special committee will be appointed to take up in detail the plans for the national electric-range campaign. This committee will meet at Chicago, May 22, during the afternoon of registration day at the N. E. L. A. convention.

Progress in Industrial Electric Heating

Baking, Sherardizing and Japanning-Oven Applications Described by H. Fulwider in Address at Boston. America Holds First Place in Electric Steel Making

The attractiveness of industrial electric heating as a field for central-station development was discussed by H. Fulwider of the General Electric Company, Schenectady, N. Y., at a luncheon attended by about 200 electrical men at Boston, Mass., on April 13.

Before the general subject of the meeting was thrown open, President E. W. Lloyd of the National Electric Light Association was introduced and spoke briefly upon the importance of co-operation between the several electrical associations of the country. Mr. Lloyd said that there is no desire in the inner councils of any of these organizations, whether they are maintained in the interest of the central station man, the contractor, the manufacturer or jobber to "put anything over" to the disadvantage of the others. All are seeking the greatest good for the industry, and a co-operative committee on relations between such associations could accomplish a great deal of good.

The National Electric Light Association, President Lloyd pointed out, is now making a very careful study of the problems of commission regulation as a result of recent developments in that important field. In at least thirty-four States public-service commissions are now at work. The association should be able to help its members more and more in dealing with regulation problems as a result of its work in this field.

UNITED STATES NOW LEADS IN PRODUCTION OF ELECTRIC STEEL

Closing, Mr. Lloyd emphasized the wonderful opportunities ahead of the industry in the distribution of electricity in large quantities. The United States leads the world to-day in the manufacture of electric steel, whereas a year ago it was in fourth place. Last year the number of electric furnaces in the country increased 48 per cent, with the prospect of a still larger gain in the next twelvemonth. The industry as a whole is going ahead on a big scale which, he declared, justifies optimism.

Mr. Fulwider, who spoke next, pointed out that 90 per cent of the industrial electric heating problems of the past came to the designer from the manufacturer. Only a comparatively few units suitable for domestic heating are applicable to industrial problems. To-day almost every manufacturer is a "prospect" for electric heating in some application which increases production, improves quality of articles manufactured, reduces the fire hazard, betters load conditions or enhances the operator's comfort. Industrial electric heating is not essentially cheaper from the fuel standpoint, but the gains outlined outweigh the added cost of electric service.

DEVELOPMENTS IN INDUSTRIAL ELECTRIC HEATING APPARATUS

A large number of lantern slides were shown of industrial electric heating apparatus of recent design, and figures were presented as to the energy consumption, temperature conditions and service of such equipment. Representive apparatus described is included in the following data:

Oven for japanning automobile hoods and fenders. Dimensions, 21 ft. by 20 ft. by 7 ft. Energy required, 264 kw. Automatic thermostat control. Can japan 30 to 40 per cent faster than with gas. Latter disadvantageous, as open flame must be baffled, wasting heat. Temperature about 500 deg. Fahr. One large manufacturer increased production 30 per cent by use of the oven, with better quality of output.

Oven, revolving type, for japanning. Height, 6 ft.; diameter, 8 ft.; width of door, 5 ft. Maximum input, 67 kw.; energy required to maintain 500 deg. Fahr., 34 kw. With work placed after oven had been heated, 1000 lb. were baked with an expenditure of 67 kw.-hr.

Small oven, 41 in. square; maximum energy consumption, 28 kw. Can be heated to 500 deg. Fahr. in one and three-quarter hours, with an expenditure of 14.25 kw. Maintenance of the foregoing temperature by 9 kw.

Baking oven for mica insulation. Three shelves, each 36 in. by 51 in. To heat oven to 300 deg. 30 kw. maximum are required. To maintain above temperature 10 kw. suffice. More than 1800 lb. of work baked with 90 kw.-hr.

Drying or baking oven, formerly gas-heated. Easily adapted to electric heating units. Dimensions, 61 in. by 51 in. by 38 in. To heat to 400-450 deg. requires 22 kw. A test of this oven when gas-operated showed a consumption of 3000 cu. ft. per day, operating at 300 deg. Fahr. At 70 cents per thousand, the gas cost was $2.10. Doing the same work electrically required 96 kw.-hr., costing 96 cents, and showing a saving of $1.14 for electric heating.

Sherardizing machine. Outfit includes small oven with revolving drum. Yields finish superior to ordinary finish, anti-rusting characteristics. Oven 40 in. by 24 in. by 24 in., requires maximum of 50 kw. to raise temperature to 600 to 700 deg. Fahr., 15 kw. to maintain temperature. With 1800 lb. work, 400 lb. of zinc dust is required. Smaller outfit, 10 in. by 10 in. by 17 in. consumes 15 kw. maximum and requires 5 kw. to maintain temperature. A charge of 150 lb. requires 40 lb. zinc dust. Batch of work can be put through in three hours.

Babbitt melting pot. Designed in the form of a crucible with jacket outside and heating unit in the base. Heats 800 lb. babbitt in one and a quarter hours with 25 kw.-hr. energy consumption.

Electric furnace, for shrinking jackets on naval guns. Typical section 6 ft. high, consumes 30 kw. maximum 1000 deg. Fahr. maintained by 14 kw. Usually six to eight sections per furnace. Guns treated for several hours.

Other applications include electric melting pots for linotype machines, a field of great possibilities; the electric vacuum furnace, with water-cooled terminals and a temperature approximating 3000 deg. C.; electric oil-tempering bath, with either hand or automatic temperature control, avoiding dangers of open flame; glue pots, and boilers.

AN 85-KW. BOILER IN A WESTERN LAUNDRY

The speaker referred to the successful installation in a laundry in a Western city of a boiler where coal costs $14 per ton consuming 85 kw., and to another boiler requiring 200 kw. installed in the Northwest. The owner of the latter boiler uses surplus power instead of facing the expense of running a steam main to his establishment.

The utilization of surplus energy from water powers is common in Europe in heating applications in connection with paper making. Again, tougher and better films are obtained in a New York motion-picture factory through the use of the electric drier, the absence of dust being a great advantage. Another novel application of electric heat on a comparatively large scale is a 15-kw. installation employed in circulating water from a swimming tank through a filtering system. Mr. Fulwider stated that the rapid advance of industrial electric heating in the past year has been due in large measure to the fact that the central station has become interested in this important and promising class of service. Consistent rates are necessary to enable this business to be obtained.

State Directors Named for Industrial Preparedness Committee

The committee on industrial preparedness of the Naval Consulting Board of the United States has announced the names of the state directors of the organization for industrial preparedness and associate members of the Naval Consulting Board of the United States. The directors were appointed from the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Chemical Society. Each state will have five directors, one from each of the above societies. Those who have been designated by the American Institute of Electrical Engineers to serve as directors for their respective states are given in the accompanying table.

As has been previously reported, the committee on industrial preparedness, through the engineers of the nation, is preparing an inventory of the country's manufacturing and producing resources as a first step in industrial preparedness. With this as a basis, it is expected that industrial preparedness can be economically and readily obtained by the placing of small annual educational orders for army and navy supplies with the thousands of establishments in the United States, and by the enrolling of skilled labor in an industrial reserve in time of peace, with a view of keeping labor at this work in the event of war.

Arrangements for N. E. L. A. Delegates to Visit Chicago's Industries

Within the last few weeks the local industries committee, which is a sub-committee of the general convention arrangements committee for the Chicago convention of the National Electric Light Association, has been hard at work. It is the purpose of this committee to make arrangements whereby delegates to the convention may visit those of Chicago's industries which the delegates themselves think of particular interest. The local industries committee consists of W. L. Abbott, Commonwealth Edison Company, chairman; H. L. Grant, Western Electric Company; W. T. Dean, General Electric Company; F. von Schlegel, Allis-Chalmers Manufacturing Company; T. J. McGill, Westinghouse Electric & Manufacturing Company; George H. Jones, Commonwealth Edison Company; S. M. Bushnell, Illinois Maintenance Company, and John G. Learned, Public Service Company of Northern Illinois.

It has been decided to prepare a booklet of perhaps 5000 words containing a list of local industries and a description of each and to have this list printed and sent to Class A members of the N. E. L. A. in advance of the convention. It was further decided that during the convention the committee will have a representative at the information office to direct delegates as to the most convenient method of reaching the industrial plants they may wish to see.

STATE DIRECTORS ON INDUSTRIAL PREPAREDNESS COMMITTEE APPOINTED BY AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

State	Director	Address
Alabama	Theodore Swann, sales manager Alabama Power Company.	Brown-Marx Building, Birmingham.
Alaska	Louis E. McCoy, power house superintendent, Treadwell Gold Mining Company.	Box 63, Juneau.
Arizona	David W. Jones, chief electrician Arizona Copper Company.	Box 716, Clifton.
Arkansas	W. N. Gladson, dean, College of Engineering, University of Arkansas.	Fayetteville.
California	A. H. Babcock, consulting electrical engineer, Southern Pacific Power Company.	Flood Building, San Francisco.
Colorado	W. S. Aldrich, associate professor of electrical engineering, Colorado Agricultural College.	Fort Collins.
Connecticut	Samuel Ferguson, vice-president Hartford Electric Light Company.	266 Pearl Street, Hartford.
Delaware	W. C. Spruance, Jr., E. I. Du Pont de Nemours & Company.	Room 760 Du Pont Building, Wilmington.
District of Columbia	John H. Finney, Southern manager Aluminum Company of America.	509 Metropolitan Bank Building, Washington.
Florida	C. S. Hammatt, president Consolidated Engineering Company.	20 Ocean Street, Jacksonville.
Georgia	A. M. Schoen, chief engineer S. E. Underwriters' Association.	Trust Company of Georgia Building, Atlanta.
Idaho	O. G. F. Markhus, general superintendent Electric Investment Company.	701 Bannock Street, Boise.
Illinois	P. Junkersfeld, assistant to vice-president, Commonwealth Edison Co.	72 West Adams Street, Chicago.
Indiana	F. S. Hunting, vice-president and general manager Fort Wayne Electric Works of General Electric Company.	Fort Wayne.
Iowa	Norman T. Wilcox, sales manager Mississippi River Power Company.	Keokuk.
Kansas	George C. Shaad, professor of electrical engineering, University of Kansas.	Lawrence.
Kentucky	Carl P. Nachod, president Nachod Signal Company.	4777 Louisville Avenue, Louisville.
Louisiana	M. S. Sloan, general manager New Orleans Railway & Light Company.	201 Baronne Street, New Orleans.
Maine	W. S. Wyman, treasurer and general manager Central Maine Power Co.	Augusta.
Maryland	J. B. Whitehead, professor of electrical engineering, Johns Hopkins University.	Baltimore.
Massachusetts	C. L. Edgar, president and general manager Edison Electric Illuminating Company of Boston	70 State Street, Boston.
Michigan	H. H. Crowell, president Michigan Railway Company.	Grand Rapids.
Minnesota	William N. Ryerson, general manager and chief engineer, Great Northern Power Company.	Duluth.
Mississippi	J. T. Robertson, secretary and electrical engineer, Mississippi Inspection & Advisory Rating Company.	503 First National Bank Building, Vicksburg.
Missouri	Charles S. Ruffner, vice-president and general manager Electric Company of Missouri.	412 Star Building, St. Louis.
Montana	M. H. Gerry, Jr., president Engineering Corporation.	Helena.
Nebraska	H. A. Holdredge, general manager Omaha Electric Light & Power Company.	Omaha.
Nevada	W. K. Freudenberger, chief engineer Public Service & Railroad Commissions of Nevada.	Box 263, Carson City.
New Hampshire	J. Brodie Smith, vice-president and general manager Manchester Traction, Light & Power Company.	46 Hanover Street, Manchester.
New Jersey	Farley Osgood, assistant general manager Public Service Electric Company.	759 Broad Street, Newark.
New Mexico	J. L. Brenneman, professor of electrical engineering University of New Mexico.	Albuquerque.
New York	William McClellan, consulting engineer	141 Broadway, New York City.
North Carolina	Charles I. Burkholder, general manager Southern Power Company.	Charlotte.
North Dakota	John F. Stevens, assistant professor of electrical engineering, University of North Dakota.	Box 1242, University.
Ohio	Samuel G. McMeen, president Ohio State Telephone Company.	1003 Huntington Bank Building, Columbus.
Oklahoma	H. V. Bozell, director school of electrical engineering State University of Oklahoma.	Norman.
Oregon	O. B. Coldwell, general superintendent Portland Railway, Light & Power Company.	602 Electric Building, Portland.
Pennsylvania	Paul Spencer, electrical engineer, United Gas & Improvement Company.	1401 Arch Street, Philadelphia.
Rhode Island	L. W. Downes, vice-president and general manager D. & W. Fuse Company.	Providence.
South Carolina	W. M. Riggs, president Clemson Agricultural College.	Clemson College.
South Dakota	B. B. Brackett, professor of electrical engineering, South Dakota State College.	Brookings.
Tennessee	F. G. Proutt, consulting engineer.	Memphis.
Texas	Fred A. Jones, consulting engineer.	Sumter Building, Dallas.
Utah	Markham Cheever, chief engineer Utah Power & Light Company.	523 Kearns Building, Salt Lake City.
Vermont	B. T. Burt, vice-president and general manager, Rutland Railway, Light & Power Company.	Rutland.
Virginia	Walter S. Rodman, associate professor of electrical engineering, University of Virginia.	University.
Washington	John Harisberger, general superintendent light and power department, Puget Sound Traction, Light & Power Company.	Electric Building, Seattle
West Virginia	H. S. Sands, president H. S. Sands Electric & Manufacturing Company.	47 Eleventh Street, Wheeling.
Wisconsin	A. W. Berresford, vice-president and general manager Cutler-Hammer Manufacturing Company.	Twelfth Street and St. Paul Avenue, Milwaukee.
Wyoming	P. N. Nunn, president Wyoming Electric Company.	Casper.

Electric Service for Crane Company's New Works

Location and Equipment of Six Building Substations Rated at 6550 Kva. in Chicago Plant—Features of Motor Installations and Their Operation from Lines of Commonwealth Edison Company's System

FOR nearly sixty-one years the Crane Company has been a pioneer and important factor in the production of pipe, valves and fittings. Up to 1915 the company's manufacturing activities had been conducted at a number of scattered factories in Chicago built and enlarged as the business expanded and at a large plant in Bridgeport, Conn., known as the Bridgeport Division of the Crane Company. The sixtieth anniversary of the firm's operation was fittingly celebrated by the consolidation of its Chicago manufacturing facilities into a modern group of factory buildings at Forty-first Street and Kedzie Avenue in Chicago. Here on a 160-acre plot of ground a works layout has been made which calls for the construction of forty-nine buildings with a total floor area of 50 acres. At present twenty-seven of these buildings, with a floor area of 25 acres and approximately double the floor space of the old factories, have been constructed. These buildings are of skeleton steel with reinforced concrete floors, hard-burned wire-cut brick facing and concrete tile roofs. The standard type of structure is two story with no basement, 500 ft. long and 80 ft. wide, with a 40-ft. court between the buildings. The investment in the works, including land, buildings, machinery and equipment, when finished as originally laid out will approximate $10,000,000. This new plant of the Crane Company will produce the standard line of Crane brass, iron and steel valves, and brass, cast-iron, malleable-iron and steel fittings for steam, water, gas and oil lines and will have one large department devoted to the fabrication of power-plant piping.

The general scheme on which the Chicago works have been laid out is to provide an uninterrupted movement of the plant product from the time raw material is received until the finished product is shipped. The same consideration has been given to all operations which are carried on in the different departments.

In working out the installation details for the operation of motors and other electrical equipment of this immense plant on purchased energy, special considerations were given to connections with the central station company's service lines and to the layout of distribution circuits in the different buildings that would be most flexible with the necessary changes resulting from future growth. The plant layout has called for the ultimate installation of eight building substations located in the center of the different groups of buildings. At present six of these substations have been installed and connected to the distribution system of the Commonwealth Edison Company so as to make available three sources of supply.

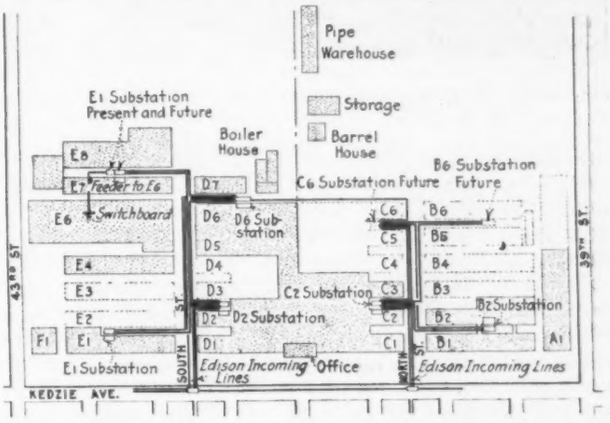


FIG. 3—LOCATION OF PLANT SUBSTATIONS AND ARRANGEMENT OF FEEDERS AT NEW CHICAGO WORKS OF CRANE COMPANY

ENERGY SUPPLY AND DISTRIBUTION

Energy is supplied for power and lighting by the Commonwealth Edison Company over 12,000-volt lines and purchased by the Crane Company at 220-volts pressure. One direct line from the Quarry Street generating station and one line from the Troy Street substation supply the Crane Company substation D-2. Another feeder from Quarry Street station loops through

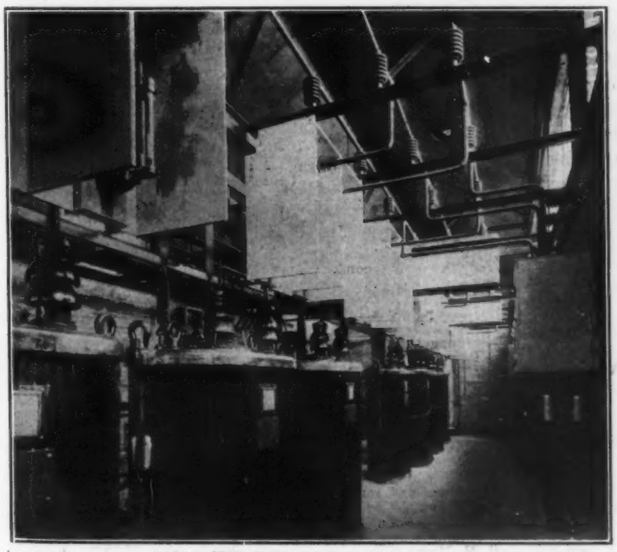


FIG. 1—HIGH-TENSION SIDE OF TRANSFORMERS IN PLANT SUBSTATION, (E_1) CRANE COMPANY'S CHICAGO WORKS

FIG. 2—LOW-TENSION SIDE OF THE TRANSFORMERS IN THE PLANT SUBSTATION SHOWN IN FIG. 1

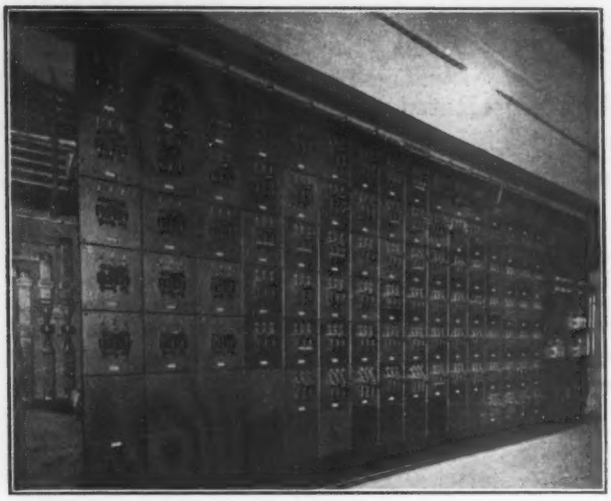


FIG. 4—SUBSTATION MOTOR SWITCHBOARD SHOWING A THREE-POLE CIRCUIT BREAKER FOR EACH MOTOR

the Electric Steel Company and Dickinson Seed Company plants and connects with Crane Company substation C-2. Troy Street substation is supplied with energy from the Fiske Street generating station. There is also a tie line between these two Crane Company substations, making a triplicate source of energy for each as well as for the substation B-2 and E-1, which are subsidiary stations of C-2 and D-2, respectively. The other substations will be similarly supplied and interconnected, as shown in Fig. 3. All high-tension cables on the property are carried underground through single cement ducts laid six wide and four high in the main run in North Street and South Street. A varying smaller number of ducts of the same material are installed in the branch runs.

In determining the number and location of substations it was considered most economical to locate one station in the center of each group of buildings. This arrangement is shown in the plant layout Fig. 3, one substation being between buildings B-3 and B-4 to serve the "B" buildings, etc. Owing to the necessity of frequent changes in the plan of the buildings, however, with the resultant likelihood of a substation located between B-3 and B-4 later on being in the way of altered building operations, it was decided to install substations with a rating sufficient for the needs of existing buildings only, and to locate them between the buildings, to insure the permanency of the electrical installation.

FIG. 5—MOTOR DRIVE FOR MUTIPLE SPINDLE DRILLS

Each substation is composed of two parts, the transformer room and a switchboard room. The former is a separate building erected adjacent to the main building and containing the Commonwealth Edison transformers and incoming oil switches, etc. The switchboard room is in the main building and contains the power switchboard on one side and the lighting switchboard on the other, with a motor-generator set at one end.

SUBSTATION PROTECTION AGAINST INTERRUPTION OF SERVICE

In each of the transformer rooms there is a double bank of three single-phase, 12,000/220-volt trans-transformers delta connected, with the "B" phase grounded at the middle point. Each bank is connected to a separate bus on the back of the switchboard, these buses being in turn connected in parallel under normal conditions. If any transformer fails, its bank can be tripped out and the entire load immediately thrown on to the good bank from the switchboard room by operating an oil switch which segregates the two buses. This saves the time of the operator going to the transformer room to disconnect the faulty unit. The entire substation load may be carried on the one bank until the operator can get to the transformer room, cut out the faulty unit, and then operate that bank open delta.

Additional protection against the possibility of any disturbance within the plant throwing out the oil switches on all three supply cables is provided on the Commonwealth Edison lines in the form of a modified Mertz-Price reverse-energy relay system for overload and line protection, which operates to localize the trouble. By this arrangement the section in trouble is dropped out, leaving the rest of the circuits operative.

Sweitzer-Conrad combination fuses and disconnecting switches are used in all the transformer buildings, and are completely boxed in asbestos cabinets. On the inside of these cabinets a cleat with a groove in it is fastened to the middle point of each side. When it is necessary to do any work on a line a fiber board is slipped into the groove between the live and dead switch poles, and a jumper is connected from the dead pole to the ground bus for the protection of the workmen. All incoming circuits and outgoing lines to the subsidiary stations are equipped with K-10 solenoid-operated oil switches controlled from the switchboard rooms.

MOTOR PROTECTION AGAINST INTERRUPTION OF SERVICE

With these provisions for continuity of service on the supply end, it was necessary to use every safeguard on the production or motor end to keep the machines constantly running ten hours a day. One feature which has been adopted to make this possible under normal operating conditions is the omission of fuses in motor circuits, to protect every motor even down to ½ hp. with overload and no voltage release provisions. Fuses could not be used with impunity, since a time loss of five or ten minutes, which would be required to replace a fuse, was considered of such importance as to warrant the increased expenditure to eliminate it. An individual conduit has been run from every motor, regardless of size, back to the power switchboard in the substation, where a circuit breaker is mounted, providing the overload protection usually afforded by fuses at the starting box.

Included in this system of protection is an alarm bell at the switchboard which rings whenever a breaker goes out. A red light at the top of each panel indicates to the operator on just which panel to look for the open breaker. Although the breakers are operated frequently, the substation attendant is able to get the motor back on the line with very little time loss. This feature in the operation of motor drives has been con-

sidered sufficiently important to justify the additional investment in the original installation.

Owing to the potential to ground on all three phases with the Edison grounded delta system, it was necessary to protect all three legs of the three-phase motor circuits. The standard two-coil circuit breakers used on the lighting circuits were not considered suitable and a new General Electric CG three-coil breaker was developed to serve the requirements. The main supply panels to the motor circuits are equipped with General Electric CP circuit breakers, which are provided with a shunt trip attachment on each leg, whereby if one leg goes out current is thrown across the shunt trips of the other two and they are kicked out also, preventing any possibility of the motors operating single phase.

The busses on the switchboard are mounted on a specially designed insulator supplied by the General Devices & Fittings Company. The very heavy surges, which the system is subject to due to the large crane motors and cupola fan load, amounting to 4000 amp. and 5000 amp., create sudden stresses which would tend to buckle and crack the ordinary insulators constructed with a hole through their center. The special insulator used is a solid piece with the bus support clamped around the outside and over the top of the porcelain, thus introducing the electrical strain as a distributed force on the outside instead of a concentrated stress from the center.

These insulators were also used for mounting the current collector rails of all cranes for the reason mentioned and because of their mechanical strength. The trolley rails are sectionalized at the center point of the crane runways by an air gap, so that in case of any trouble with the trolleys only half of the runway will be tied up. The 10-ton d.c. magnet crane in the iron receiving room is driven by a slip-ring motor and hence has two trolley rails, both of which are mounted on the special insulators.

THE DIRECT CURRENT SYSTEM

Direct current is furnished for the crane magnets, elevator motors, K-12 switches, and for charging the storage-battery trucks, by 250-volt motor-generator sets varying in size from 50 kw. to 150 kw., depending on the requirements in a particular building. Each direct-current motor circuit is protected by a standard General Electric CP, double pole breaker mounted on the lighting switchboard. The motor-generator sets in the several substations are all paralleled by a tie-line circuit equipped with no-voltage coils on the a.c. breakers, which trip the breakers when the voltage drops below 200.

The direct-current system of the plant includes twelve electric tractors made by the Crane Company for its own use about the works. These are equipped with forty Edison storage-battery cells charged three cells in series, and will pull from 6-ton to 9-ton loads. They are driven by a General Electric automobile motor mounted in front and connected to the Timken bearing rear axle by shaft and worm gear. Their operating range is 25 miles on a charge. A standard automobile controller is installed under the driver's seat. These tractors will make 12 m.p.h. when pulling a 3-ton load.

CONDUIT SYSTEM

The conduit system for lighting circuits and motor circuits has required about 37 miles of pipe in the present installation. No smaller than 1½-in. conduit is used for any motor lead, and these numerous motor conduits are laid on one another in steel hangers suspended from the ceiling. The lighting conduits are carried largely on the ceiling, and extensive use is made of Adapti boxes in turning corners and for connecting

FIG. 6—ELECTRIC TRACTOR USED IN CRANE COMPANY'S PLANT FOR TRANSFERRING MATERIAL

with branch circuits. The conduit for power circuits was furnished by the National Metal Molding Company and that for lighting circuits by Western Conduit Company.

NUMBERING OF MOTORS

Each motor is given a number, as, for instance, (D3-2 F-350) and its panel on the switchboard is similarly marked. This number has a definite significance to the electrical trouble man, for when that motor is reported out of order he knows that it is in building D-3, which is in the third building in the fourth row (see drawing), on the second floor and motor No. 350.

The present transformer installation of the plant is made up of five 150-kva. and twenty-nine 200-kva. units, totalling 6550 kva. The ultimate rating will be probably three times this amount. There are 557 motors installed ranging from ½ hp. to 50 hp., and having a total rating of 6137 hp. The average rating is slightly more than 11 hp. All of the electrical equipment throughout the Crane Company's plant is of General Electric Company manufacture, which has been adopted as the standard by the Crane Company. The electrical equipment was laid out and its installation supervised by H. S. Stewart, chief electrician of the Crane Company.

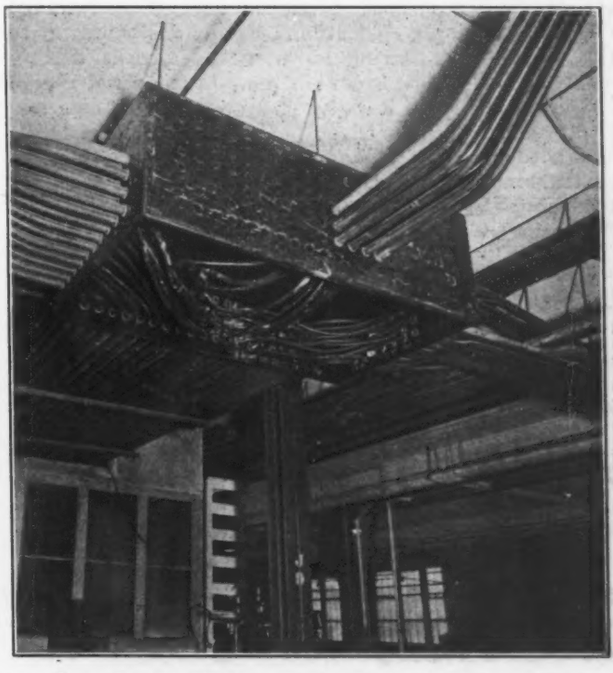
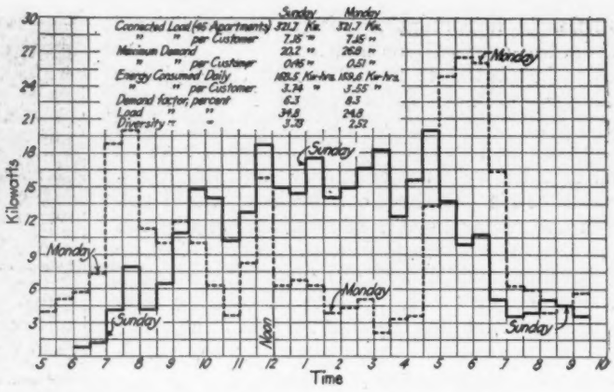


FIG. 7—LARGE TERMINAL PULL BOX FOR MOTOR CIRCUITS AT ONE OF THE SUBSTATIONS



A TYPICAL ELECTRIC KITCHEN IN THE TUDOR ARMS APARTMENTS, PORTLAND, ORE., AND SAMPLE TOTAL-LOAD CURVES FOR THE FORTY-FIVE RANGES IN SERVICE IN THE BUILDING

Establishing the Electric Range in the Far West

The "Cook-by-Wire" Movement Which Is Manifesting Itself Throughout the Pacific Coast Country—A Review of the Range-Selling Methods, Rate Schedules and Metering Practices Used with Success by the Principal Western Companies

NO commercial problem is now engaging the attention of central stations west of the Rockies to the degree that those companies are at present studying the opportunities for the greater sale and use of electric ranges. There was a light but general sale of these appliances along the Pacific Coast last summer, the important effect of which was to impress upon both central stations and the public the practicability of electric cooking. This experience has served to whet the appetite of all concerned, and the observant visitor to the Coast country will find on the part of the public there, an alert interest in the subject of electric cooking, that has its appropriate counterpart in the full appreciation of the possibilities of the electric-range load held by the executives of the utility companies of that great section.

Of course, those companies with a considerable electric-range load already developed have the advantage and are launching educational campaigns pointing to the success of "cooking by wire" as already demonstrated. But almost every company in the Coast region has developed some working plan suited to its own territory, and from San Diego to Seattle—from the Mexican border to the Canadian line—wherever there is central-station service, some method for effectively introducing electric ranges is being pushed this season.

Consumers are learning that cooking by wire is not unreasonably expensive; that the shrinkage of roasted food with electric cooking is far less than when the clumsy combustion of fuel is the source of heat, and that the conveniences in electrical temperature control are even greater than has been claimed. It has become evident, too, from the central-station standpoint, that with proper sales methods a great many ranges can be put on the lines, and that these mean not only an increase in sales of energy, but also probably a greater market for electric service in the home and in the shop.

THE EASY WAY
A representative of this Company will call upon you within the next few days to tell you of something which we have to offer - and which you really need. LOOK FOR HIM. Maybe you are in a hurry, if so telephone
Southern California Edison Co.

THE POST CARD THAT PRECEDES A CALL BY THE LOS ANGELES COMPANY'S RANGE SALESMAN

ELECTRIC COOKING AS A CENTRAL-STATION LOAD

The Pacific Coast central stations have manifested the keenest interest in attacking the problem of a satisfactory plan for the electrical heating of water. In the following paragraphs some of the modern practices in this respect are recounted. The report of the N. E. L. A. range committee has been carefully studied and schemes for the co-operation of central station with manufacturer and with jobber and dealer have been thoughtfully considered.

In the course of these broadly-planned investigations on the subject of the cooking load, the average figure for the annual income from residence lighting load on the Pacific Coast has been found to be $21, and where electric cooking is in use it has been shown that the average residence revenue is increased to about $60 per annum. Under conditions prevalent in the Far West, it should also be noted, the highest cooking peak usually comes on between 11.30 a. m. and 1 p. m., a time when it fits in well as a complement of the sag in the commercial load curve.

As examples of the impetus of the new movement, it may be pointed out that in a recent four-month period, the Southern California Edison Company placed more than 200 ranges on its lines, and in nine months the Great Western Power Company increased its revenue from the appliance field by $16,300.

Ranges are beginning to be ordered in carload lots, and in the North, one central station has well figured that it would be worth while to spend $50,000 this year in advertising and such general educational work as would aid in introducing the electric range throughout its territory.

In short, broadcast throughout the entire Coast section, a vigorous movement has been launched to take

advantage of conditions favoring the introduction of cooking by wire on a large scale.

At the outset of the electric-range movement the prevalent idea that the cost of cooking by wire would be excessive was the greatest obstacle to be overcome, and salesmen required, more than anything else, information about range prices and the size of average monthly bills. But as the range has come into more and more general use it has been demonstrated that electricity as heat is worth more than heat of other sort, and the consumer is willing to pay the slight additional cost. Moreover, it has been possible to make a rate of 3 cents or even less per kilowatt-hour for electric cooking all along the coast, and on this basis the monthly bills are not more than the family in moderate circumstances can well afford to pay. The tables of cost of electricity for cooking for families of various size, which were compiled and published in the report of the N. E. L. A. electric range committee, have been used extensively and are considered as fair statements of what actually occurs in practice in the Coast section.

The methods of metering the electricity used for electric cooking vary greatly. Separate meters for range and lighting circuits are often installed, particularly where a hot-water heater is put in with the range. Some companies put the range on the lighting-circuit meter and fix a block rate to suit. Such rates vary from 5½ to 8 cents per kilowatt-hour for the first 20 to 45 kw.-hr. and from 2 to 5 cents per kilowatt-hour thereafter. Many companies do not meter the consumption of the hot-water heater, charging for this service a monthly flat rate of about $3. It is, however, almost always stipulated that water heater and range are both to be served through the same double-throw switch so that both cannot be operated at the same time. Where the water heater is on a flat rate it is customary to keep the current turned on continually except when the range is in service. Thus the boiler is well heated over night and if properly lagged will remain hot enough through the day to supply the demand while the range is in service and the water heater is off.

THE WATER-HEATING PROBLEM

On 30-gal. boilers some 500-watt heaters have been used, but these have generally proved less satisfactory than those of 750-watt rating; in fact, the latter have been put in where some of the 500-watt heaters were taken out as unsatisfactory. A few heaters of 1000-watt rating are also used to some extent on 30-gal. boilers, notably on the lines of the Pacific Light & Power Company of Portland. In some instances even 1500-watt coils have been put on 40-gal. boilers, but these larger sizes have been found to be larger than necessary and very undesirable by reason of the capacity in local transformers which any considerable number in a given district would make necessary. The water heaters admittedly involve the greatest problems thus far encountered, and as a result of the experience gained in setting a satisfactory cooking rate, the tendency is apparently toward a flat rate for a low-capacity heating unit connected so it cannot be used when the range is in service.

DEMONSTRATING ELECTRIC RANGES BY MOTOR TRUCK IN A TOWN NEAR SPOKANE, WASH.

It has been pointed out that at the very outset of a program for introducing electric ranges there should be established a fairly high minimum monthly service charge, say $1.50 to $2 per month. If the first ranges are placed on this basis it can be explained to the consumer that the monthly bill should be expected to exceed this at all events, if the range is to be used effectively, and under such circumstances the minimum charge is not considered likely to interfere in any way with the sales.

From the central-station standpoint, moreover, it is very desirable to have guaranteed a certain income on a yearly basis and at the same time to discourage disconnecting the range during the winter. It is interesting to note that in a climate as cold as that of Spokane, Wash., where the Washington Water Power Company has 200 ranges on the line, this year only five were disconnected for the winter. One Coast company which has in effect a 50-cent minimum rate would now be very glad if a higher figure had been established originally, but is unwilling to interfere with the rates on which the sales methods are now based.

The campaign plan of introducing the electric range has in large measure given way to the policy of instructing district agents in range selling methods and otherwise depending on the company's own local forces

A CONSIGNMENT OF SIXTY RANGES FOR A SOUTHERN CALIFORNIA DISTRICT. THESE RANGES WERE SOLD IN SIX WEEKS, EACH RANGE GOING INTO A SEPARATE HOUSE

exclusively for getting the ranges on the system. Unlike socket appliances that have already been popularized, the range requires special aggressive, educational methods to effect its sale. The element of the sales policy considered most important to the widespread and permanent use of the range is the rendering of proper service by the equipment after the range is actually installed. Nearly all central stations on the coast now send an expert in cooking on electric ranges (usually called a "home economist") to call on the purchaser a few days after the range is installed. Such visits have come to be considered indispensable to getting the customer away from gas-stove habits and are continued as long as necessary to show the consumer how to use the range most effectively and economically.

Several central stations have been selling ranges at cost for cash, or at 10 per cent advance on installments, charging only time and material for installation. On this basis any advance in price due to the nichrome-patent situation or the revision of discounts in favor of the jobber would materially affect the price to the consumer and thus increase the difficulty of making sales. Announcement of a tentative increase that would in some cases amount to more than 40 per cent in the selling price caused the protest from the central stations commented upon on page 636 of the ELECTRICAL WORLD of March 18, and since that time definite steps have been taken by the central stations toward securing a readjustment of the discounts.

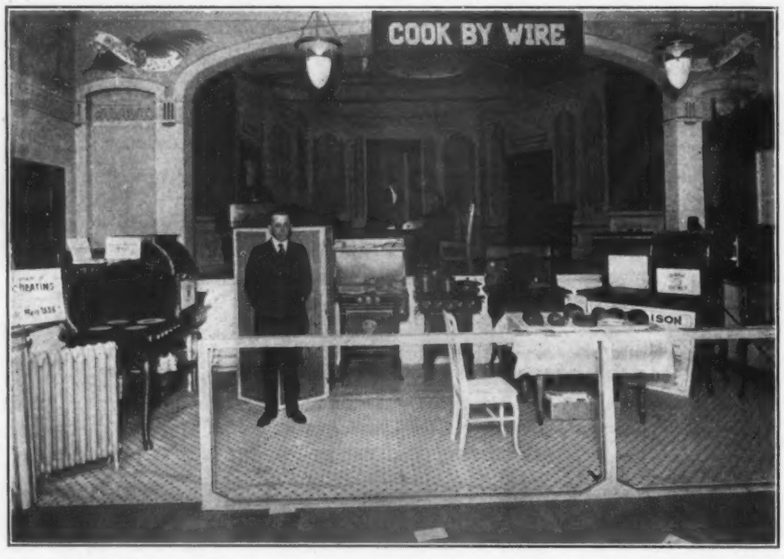
The majority of range sales are made at prices between $55 and $80, although there are a considerable number in the South which are sold as low as $35 exclusive of wiring. The average prices in the Northwest are higher and many $90 and $95 ranges have been placed. A price of about $100, exclusive of wiring, seems the limit beyond which few sales are made.

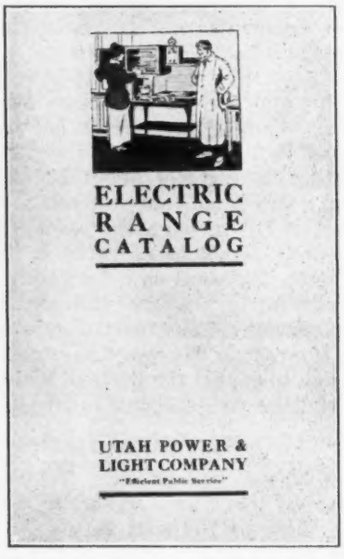
The installation cost varies very greatly according to individual conditions, as does also the plan under which this work is done. In the small towns where there are no contractors to call upon, the ranges are installed by the district force of the central station, but in the larger cities it is customary to distribute this work among local electrical contractors. Effort has been made to do this in such a way as to secure the active co-operation of the contractor in developing more electric-range business.

Sales managers all along the coast employ electric ranges in their own homes and point out that no salesman can attain his maximum usefulness as a bonafide booster for cooking by wire until he actually uses a range in his own home and gains first-hand knowledge.

Most of the range sales are made directly to women, and the greater percentage of ranges sold are those with neat and attractive white enamel backing and nickel-plated trim. So important is this element of attractive appearance that the tendency along the coast is well shown by the policy of one company which has gone so far as to rule that only ranges of attractive appearance shall be used for demonstration.

Lists of prospective range users are being compiled effectively by sending out series of form letters to selected lists of customers. This is done on the basis that only certain of the residence lighting customers are desirable range "prospects," and the sales manager selects this list to which is sent a follow-up series of letters conveying information calculated to arouse interest in cooking by wire. With these is sent a mailing card asking for further details, which the consumer can fill out. The reports of the salesman canvassing this list, together with the mailing cards that come back, are then used to get up a classified list of "prospects" on which intensive methods are used and from which a fair percentage of sales usually result.





A "COOK-BY-WIRE" EXHIBIT AT SEATTLE—AT THE RIGHT IS SHOWN THE COVER OF A CATALOG ISSUED BY THE SALT LAKE CITY COMPANY GIVING DETAILED INFORMATION, PRICES, ETC., FOR THE PRINCIPAL ELECTRIC RANGES ON THE MARKET

It is particularly notable that these methods are producing results in the face of keen competition with gas. For example, nearly all the 220 ranges sold by the Portland company were placed in territory served with gas.

The Portland company recently held a range demonstration every day for a week in one of the local department stores. Suitable advance publicity was given by means of street car, newspaper and billboard advertising, and with all customers' bills were mailed range manufacturers' pamphlets and local literature.

In the data compiled last September for the N. E. L. A. range committee report twenty-six companies were quoted as having indicated they would purchase in 1916 a total of 4975 ranges. During March a representative of the ELECTRICAL WORLD visited practically all of the central stations on the Pacific Coast and reported that seven of the Coast companies alone have about 2000 electric ranges already actually in service.

Sales managers in general expressed the feeling that the estimate made last September for the 1916 range business will actually be exceeded during the year.

Can the Jobber's Small Order Pay Its Way?

BY EARL E. WHITEHORNE

There is no issue which confronts the electrical industry to-day that is of greater interest or importance to all classes than the jobber's growing problem of the small order. Many dealers, contractors and central-station men have given little thought to it, because apparently it does not vitally concern them. Yet it does concern them. It concerns them closely, because the jobber is a working link between these local operators and their sources of supply—an economic factor in their individual enterprises—and conditions which are hurtful to the jobber are in turn inimical to their own interests. And so the fact that month by month the jobber loses money on all small orders is a matter that his customer should think about. To anyone who has not looked into this, the figures are astounding, for they show that practically without exception among the jobbers of this country from one-third to two-thirds of the orders filled are sold at actual loss. Some way must be discovered to avoid it.

THE tables which accompany this article present some interesting facts which have been gleaned by the analysis of all the business done within a corresponding period by two large jobbing houses—one located in the East, the other in the Middle West. In the compilation of the data, careful records have been kept of every order received, and what it cost for the material involved and just what charges for overhead expense should rightfully be reckoned on each one, and the results are most illuminating.

The Eastern jobber finds that on 53¾ per cent of all the orders that he fills the average profit figures less than 60 cents, while the average operating cost—in other words, the proper charge for overhead against this order—is just 98 cents. In short, he actually loses about 38 cents each time he ships an order aggregating less than $5, in spite of the fact that more than one-half his orders are of this unprofitable size. Of course, this does not mean one-half the value of his business, but it does mean more than one-half of the actual number of the orders that are handled.

The experience of the Western jobber is very similar, for though his percentage of large orders is twice as great and his proportion of orders amounting to less than $5 is much less—that is, thirty-four out of each 100 orders received—his average profit on such orders is but 68 cents and his overhead expense on each one of them is $1.13, which makes his loss on orders of this size just 45 cents each—even more than that of the Eastern jobber already mentioned.

The electrical jobber, therefore, finds himself involved in a condition which is penalizing him on half the orders that he fills. He knows that every order totaling less than $5 will not pay its way, and yet these orders must be filled and all the loss which they occasion must be recouped from other business. It is a situation that should be understood by every one of his customers. Why is it so? What can be done?

The increase in the number of small orders which the modern jobber is called upon to fill is an outgrowth of the better service which is being rendered to the trade. Whereas a few years ago the jobber's salesman was accustomed to call upon a customer perhaps once a month, nowadays in many cases somebody's salesman sees that customer each day and asks for business. Every buyer is being continually solicited, and it is only human that he should fall into the habit of dividing his business, and ordering materials in smaller quantities as he may need them. Along with this have also come improved facilities for delivery, and the parcel post has proved a mighty stimulus to buying in small quantities. For in the mind of the local buyer the parcel post presents a comparatively cheap and a most convenient method of securing goods.

A man who a few years ago would have hesitated before asking the jobber to make an express shipment, will now telegraph for goods that will not cost $1 and think nothing of it. He sees only the cost of transportation. He overlooks the jobber's cost of handling his $1 order by the parcel post, and yet in many cases it costs the jobber more to ship this order than it would to send a larger order by express, because the postal parcel he must deliver to the post-office, whereas the express company will send its wagon. Moreover, the convenience of the parcel-post delivery has worked to the discouragement of the former habit of ordering ahead and making up out of the catalog a sufficient quantity to warrant a freight shipment.

In other words, the increasing competition of good service has tremendously augmented the jobber's cost of doing business by inducing this great multiplying of small orders that at present do not pay their way.

The development of these new influences in the jobber's business and their extravagant effects have been gradual. Each jobber saw the trouble coming, and the natural and proper measure of broader scales of discounts was devised to offer proper compensation to the man who buys in quantities that offer corresponding profit to the man who sells. Instead of just two discounts, one for standard and one for broken packages, a scale of five discounts was introduced on varying quantities. But the evolution in the buying habits of the trade outsped the power of such inducements, until the jobber finds himself to-day compelled to stand a loss on every other order that he fills and pay it back out of the profits of the next, and this he realizes is economically wrong in principle.

We know that the department store habitually sells certain goods at less than cost, for advertising purposes, and pays this loss by other goods that sell at fancy profits; but the cases are not parallel. The bargain goods of the department store in most part are goods bought for bargain sale and at a cost far less than is appreciated by the purchaser. The customer comes into the store to buy and there is brought under the influence of all the other offerings that are depended on to pay the profits; in other words, to pay the cost of the advertising-by-the-bargain. The bargain price, moreover, is not allowed on every article of merchandise at the selection of the customer, as is the case where less-than-profitable orders are required of the jobber of electrical supplies. That is just about what it amounts to, for though the cost of delivery in the department store may steal all profits from the sale of a spool of thread, the prices in this store are calculated on the basis of such a retail business. But the jobber's prices must be calculated on a jobbing basis, and as yet do not adjust themselves to this new-come condition which approximates long-distance retail sale by mail. Therefore, the argument that cites the department store bargain to justify the conditions that now beset the jobber is ill taken. Small orders are not offered by the jobber

as bargains. The loss cannot be charged to advertising.

The solution that first naturally suggests itself is for the jobber to charge more for these small under-$5 orders that he now is losing money on—a handling charge—or a higher price, enough to cover cost and proper profit. There are two good reasons why this cannot be done: first, the jobber does not want to and, second, the customer does not want him to. The jobber cannot afford to raise the price on such small orders so high that the customer is compelled to buy in larger quantities, because he knows that this will mean the forcing of a further complication, in the shape of "one-horse" local jobbing-dealers in each city who, because of the high price of small orders purchased from legitimate jobbers, will be enabled to buy in standard package lots and sell to local contractors and dealers at a cut price. This would work an evil both to contractors and dealers, for it would cost the jobber much good business, and the contractor would lose the benefit of the good service that he now enjoys. For the little jobbing dealer could carry but a limited line of staples at best, and without responsibility, experience and organization, could serve but poorly.

Moreover, the fact that this small-order business has developed to so great a volume is an evidence that it must offer some substantial benefit, and if it does it cannot be condemned off-hand. So if the trade finds that this buying in small quantities is advantageous, then the problem should be not how to prevent it, but how to so control it that it will not cause a loss to every jobber. Also, the jobber knows that this small-order business is not an unmixed evil even as it stands, because it tends to limit the demand for credit from the buyers of small means. The bulk of every jobber's bad-debt loss is made up of small-order business, sold to men to whom the jobber would prefer not to sell in standard packages. And so the plot thickens.

There may be cases where much of the loss the jobber suffers on small-order business is caused in part by excessive system detail in the handling of the order. Opinion differs on this point. Some jobbers handle large and small orders by the same routine. Some do not. It is a factor worth each man's consideration. But a study of the data that have been provided by these two jobbers seems to bring out one fact of supreme importance that suggests the direction from which relief can be expected, and to point the way in which the industry must work out the solution to the problem.

It is the fact that even as the order less than $5 in size is now sold at a loss, so is the order with a total over $100. In other words, this proves that as the run of business operates in the jobbing of electrical supplies, the very small order is a loss because of the excessive cost of handling it, and the very large order is likewise unprofitable because it earns so big a discount that it will not carry its pro rata cost of overhead. Therefore, clearly it is the intermediate business—orders ranging between $10 and $100—that the jobber wants. It is the $25 and the $50 order that is made up of a half a dozen items or so, all sold at a good price, that supports the institution and makes possible the service. In short, though the $5 order is a loss when it comes in alone, if the customer will but group together five or ten of such $5 orders that may be handled as a unit, there is money in it for the jobber and his customer as well. That is the point that has been overlooked. Men have forgotten that there is a "cost of overhead" in buying, no less than in selling, and in receiving goods and checking bills, no less than in the shipping and the invoicing. And after all, this

AN ANALYSIS OF THE COSTS INCURRED BY TWO ELECTRICAL

One of these jobbers is located in an Eastern city—the other is in business in the Middle West. For convenience in reference the figures relating to the two firms have been combined in a single table—the figures for the Eastern jobber being presented in light-face type, while those for the Western company appear in **boldface or black-letter**

Amount of Order	Percentage of Orders (or Number in 100 Orders Received)	Total Amount	Selling Price per Order	Cost of Goods per Order	Profit per Order	Percentage of Classes 3 and 4, Expense That Each Class of Orders Should Bear, Based per Value of Orders in Dollars at Cost	Average Number of Items per Order	Percentage of Class 7 Expense That Each Class of Orders Should Bear, Based on Number of Items —No Order Considered Less Than Three Items	Average Actual Weight, Pounds	Percentage of Class 8 Expense, Each Class of Orders Should Bear Based on Actual Weight	Percentage of Class 5 Expense That Each Class of Orders Should Bear—Based on Actual Weight, No Order Considered as Less than 100 Pounds	Average Actual Box Cost	Percentage of Class 2 Expense That Each Class of Orders Should Bear, Based on Number of Orders	Percentage of Classes 1 and 6 Expense That Each Class of Orders Should Bear, Based on Number of Orders
Less than $5	56	$93.58	$1.74	$1.14	$0.59	5.23	1.57	50.6	4.3	7.20	44.84	$0.056	21.0	53
	34	**69.02**	**2.03**	**1.35**	**.68**	**1.93**	**1.46**	**28.3**	**9.0**	**1.87**	**16.83**	**.018**	**8.4**	**34**
$5 to $10	14	99.57	7.11	4.86	2.24	5.82	2.48	13.2	26.3	11.30	11.71	.222	21.9	14
	16	**117.28**	**7.33**	**5.04**	**2.29**	**3.39**	**2.13**	**13.3**	**48.0**	**4.71**	**7.90**	**.048**	**10.2**	**16**
$10 to $25	16	256.23	15.76	11.73	4.03	16.09	3.11	15.7	59.3	29.36	13.43	.339	38.8	16
	27	**464.67**	**17.21**	**13.10**	**4.11**	**14.89**	**2.71**	**22.5**	**130.0**	**21.52**	**17.35**	**.080**	**28.8**	**27**
$25 to $50	8	306.95	36.11	29.34	6.76	21.54	3.58	9.8	94.0	24.91	7.18	.211	12.6	8
	10	**373.30**	**37.33**	**29.93**	**7.40**	**12.60**	**4.00**	**11.1**	**245.0**	**15.02**	**12.10**	**.090**	**12.1**	**10**
$50 to $100	6	376.72	68.49	56.32	12.17	25.75	4.35	7.3	134.0	22.12	6.00	.109	4.2	6
	8	**639.62**	**75.20**	**62.03**	**13.12**	**22.19**	**5.45**	**12.5**	**554.0**	**28.88**	**23.27**	**.158**	**17.9**	**8**
$100 and over	2	333.66	168.33	148.74	19.58	25.57	5.36	3.4	81.4	5.05	16.84	.090	1.2	2
	5	**1208.11**	**268.47**	**237.47**	**31.00**	**45.00**	**9.60**	**12.3**	**1014.0**	**28.00**	**22.55**	**.379**	**22.6**	**5**
	100	1469.71				100.00		100.0		100.00	100.00		100.0	
	100	**2872.00**				**100.00**		**100.0**		**100.00**	**100.00**		**100.0**	

matter of small orders is a burden and a menace to the contractor and dealer quite as much as to the jobber.

The economic function of the jobber of electrical supplies is a double one—to carry the credit risk and the detail for the manufacturer, and to conveniently accumulate and carry the stock that every local man must have at hand and cannot afford to buy and hold himself. As one Southern jobber has expressed it:

"Being a jobber, I advocate among my customers the policy of allowing the jobber to carry the stock. I preach to the customer the desirability of limiting his own stock and the folly of indiscriminate buying and overloading merely to save a slight difference in price. He should be educated to the fact that, while the jobber wants to carry the stock for the retailer, and wants to render him certain necessary facilities and conveniences, these facilities and conveniences cost money and can only be had by the payment of a proper charge therefor. Consequently, I think the jobber should be equally zealous in advertising truthfully his cost of doing business so that the purchasers may know that if they are not willing to pay for the jobber's services he cannot exist, and therefore they cannot have the benefit of his services."

And there you have it. Clearly this fast-growing practice of single small-order buying is a simple matter of bad habit that must be corrected. In the gradual extension of the service offered by all jobbers to the trade, the local buyer found a new convenience, a new easy way to buy from job to job, and though the principle is excellent the habit has run away with him, until it long since passed the danger line, and the seller is obliged to give too much in overhead expense to make it profitable to either. It does not pay the contractor to stop and send a telegram and write a letter and receive a package and check up a bill and charge the item through his books and pay for it, when all that has been purchased is six sockets—because the profit that he will make on those six sockets cannot equal what it actually has cost him in good labor to buy them. It does not pay the jobber to sell six sockets, if he must receive a telegram, make out an order form in triplicate, send copies to the warehouse, customer, and the salesman in the territory, collect and wrap the goods, make out the shipping label, deliver to the post-office, make out the bill and mail it—because the cost of doing all this work is more than the small profit margin on six sockets. And there you are. Small orders like this are unprofitable to both the buyer and the seller, and it is time that both of them should understand it and arrange their business habits to overcome it.

As the Southern jobber puts it: "The small order is welcome, but it must pay its way." And it can only pay its way when grouped into shipments that can be economically handled both by the seller and the buyer. This simple fact must be impressed upon his customers by every jobber. It is the only way in which the problem will be solved. For the secretary of the National Supply Jobbers' Association has stated that in 1912 the average of less-than-$5 orders handled by all the jobbers reporting to the association figured 47 per cent, but that it was estimated now to be nearer 65 per cent. In 1912 the average cost of selling $1 worth of goods in these small orders was 68 cents, yet the profit margin on these sales was only 25 per cent to 30 per cent. In short, it all cost money then, and to-day the costs of doing business are materially increased. Here is an economic waste that neither the jobber nor his customer should suffer to continue, and the industry must educate all men to recognize this fact.

JOBBING HOUSES IN HANDLING ORDERS OF VARIOUS AMOUNTS

figures. As above pointed out, this form of presentation has been adopted for convenience of reference only, and not for comparison of values or costs, since the conditions under which the two businesses are operated are quite dissimilar.

Average amount per 100 orders																				$1469.71 2872.00				
Present rate of expense																				18.0% 16.9%		266.00 486.71		
Class 1 0.47% 0.26%		Class 2 0.08% 0.19%		Class 3 2.94% 5.05%		Class 4 5.70% 4.86%		Class 5 1.27% 1.27%		Class 6 1.74% 0.67%		Class 7 2.10% 1.96%		Class 8 3.80% 2.70%										
Stamps and Stationery Used for Acknowledgments, Bills, Statements, Etc.		Boxes, Lumber, Paper, Etc.		Principal's Salaries, Attorney Fees, Jobbers' Association Exchanges, Mercantile Reports, Telephone and Telegraph Catalogs, Conventions, Discount Sheets and Postage on Same, Miscellaneous		Salesmen's Salaries and Expense; Store Clerks		Shipping or Stock Clerks, Assemblers and Warehouse Men		Bookkeeping and Credit Department Salaries		Balance of Office Force		Rent, Insurance, Taxes, Interest on Investment, Interest on Borrowed Money, Light, Heat, Etc.; Teaming		Operating Cost per Order		Operating Cost in Per Cent of Sale		Gross Profit in Per Cent of Sale
Total	Each	Total	Each	Total	Each	Total	Each	Total	Each	Total	Each	Total	Each	Total	Each									
$3.72	$0.069	$0.25	$0.004	$2.07	$0.038	$4.02	$0.074	$9.83	$0.183	$13.74	$0.256	$15.49	$0.286	$4.02	$0.074	$0.98		56.7		34.4				
2.50	.0735	.48	.014	2.80	.082	2.69	.079	6.15	.18	6.57	.193	15.91	.467	1.44	.042	1.13		55.6		33.5				
.97	.069	.25	.018	2.33	.166	4.52	.323	2.58	.184	3.58	.256	4.04	.288	6.31	.45	1.75		24.6		31.5				
1.18	.0735	.57	.036	4.92	.307	4.74	.296	2.89	.18	3.09	.193	7.48	.468	3.62	.226	1.78		24.3		31.2				
1.12	.069	.46	.028	6.44	.396	12.48	.768	2.97	.182	4.16	.256	4.88	.300	16.48	1.01	3.00		19.1		25.5				
1.98	.0735	1.62	.060	21.60	.80	20.80	.77	6.34	.235	5.22	.193	12.65	.468	16.54	.613	3.21		18.6		23.8				
.59	.069	.15	.017	8.43	.991	16.34	1.922	1.57	.184	2.17	.256	3.06	.360	13.68	1.609	5.40		14.9		18.7				
.74	.0735	.68	.068	18.28	1.83	17.59	1.76	4.42	.442	1.93	.193	6.24	.624	11.54	1.154	6.14		16.4		19.9				
.36	.069	.05	.009	10.50	1.909	20.36	3.701	1.36	.247	1.41	.256	2.31	.420	12.57	2.285	8.89		12.9		17.7				
.62	.0735	1.00	.118	32.20	3.79	30.99	3.65	8.51	1.001	1.65	.193	7.03	.827	22.20	2.61	12.26		16.3		17.4				
.14	.069	.02	.01	13.44	6.720	26.05	13.025	.35	.175	.51	.256	1.08	.540	2.79	1.395	22.19		13.1		11.6				
.33	.0735	1.28	.282	65.29	14.51	62.85	13.97	8.25	1.832	.87	.193	6.92	1.535	21.52	4.782	37.18		13.8		11.6				
6.90		1.18		43.21		83.77		18.66		25.57		30.86		55.85										
7.35		5.63		145.09		139.66		36.56		19.33		56.23		76.86										

Keeping Down the Contractor's "Overhead"

The Business Methods of a Minneapolis Firm Which Has Simplified Its Office System, Expense, and Investment to a Minimum—Purchasing in Quantities at Cash Prices

THE problem of increasing the net returns of a business—be it electrical contracting or the selling of merchandise—can be attacked, obviously, in one of two ways: (1) By increasing the volume of business and hence the gross earnings; and (2) by reducing expenses. Sometimes the latter plan offers the advantage of immediate practicability in cases where it is not possible or desirable to increase the gross amount of business done. And among all the items that enter into the expense side of the ledger, none will bear watching more closely than the matter of overhead expense.

In the conduct of the electrical contractor's business, particularly, such overhead charges well merit the most careful study to reduce them to the smallest terms. Close attention to the reduction of expense has been an important factor in the success of V. S. Beck of the Beck Electrical Construction Company of Minneapolis, Minn., and his business methods bearing on this matter of "keeping down the overhead" have some interesting lessons for other electrical contractors who have been confronted by similar problems.

Office and Shop in Downtown Building

A central location for shop, storeroom and office is a great asset to any electrical contractor, but the expense of such a location is usually prohibitive, and especially is this true in the case of small firms. Mr. Beck solved this difficulty, however, by renting a room of about 350 sq. ft. floor area in the basement of one of the principal office buildings in the heart of the Minneapolis business district, and at the same time engaging an office on the eleventh floor of the same building. Eight passenger elevators and one large freight elevator connect office and shop. The freight elevator, communicating with a loading platform at the rear of the building, is capable of carrying to the basement store as much as a quarter of a carload of pipe at one load. A private telephone system between the shop and office completes the close connection of the two. The total rental is, of course, only a fraction of what equal space on the ground floor in the same district would cost.

The shop and stockroom in the basement, with its tile walls and steel doors and sprinkler system, is entirely fireproof. It is equipped with a work bench and vise, and shelves and bins for storing materials and supplies, but is used for storing only the left-overs from the bigger jobs, since large-quantity orders are stored elsewhere outside the business district by an arrangement which incurs no storage expense, as will be explained in a later paragraph.

No attendant is kept in the basement stockroom, but when any workman needs to get in to this room for additional material, he simply comes into the basement of the building and communicates with the office over the private telephone which is mounted just outside the stockroom door. The office attendant can then operate the electric lock on the stockroom door from a push button on the upper floor. Thus admitted, the workman helps himself to the material he needs. "I have my office boy keep tab on the stock," says Mr. Beck, "but there isn't much to keep track of, for I hold the quantity of stock down by supplying the small jobs from this stock and just bring in the left-overs and returned supplies from the big jobs to this storeroom. I suppose I never have more than 1500 ft. of conduit in this central stockroom at a time, and the wire and other supplies will figure up proportionately. I aim to have just as little money invested in this stock as possible, and probably have not more than $3,000 tied up in the whole business at any one time, outside of accounts collectible."

The office force consists of a stenographer-bookkeeper and an office boy, at an expense for both of $1,000 a year. The double-entry bookkeeping, stock and cost records systems have been simplified to the last degree, so that the operation of these systems does not require a great deal of time. Mr. Beck does all his own estimating since, he declares, his experience with the estimators he has employed from time to time has been to his financial unhappiness on practically every contract.

When a contractor can purchase material in carload quantities he can command services and prices otherwise not obtainable. Through such a method the Beck company has been able to have the greater part of its material stored by the jobbers and delivered as needed to the various jobs. This not only cuts down the storage space required and hence the overhead, but also contributes to the balance sheet the 10-per-cent-better price which, for example, prevails on the carload lot of pipe, as compared with the price on a 10,000-ft. lot.

As soon as a car is received the bill of lading is turned over to the jobber and a check for the total, less the cash discount, is sent him at once. The material is then stored in the jobber's warehouse and is covered by the jobber's blanket insurance. If collections are slow, it is possible to borrow money at the bank at 6 per cent per annum for prompt payment for the order. This 6 per cent is, of course, more than offset by the 10 per cent "quantity" discount and the 5 per cent cash discount already realized. The note may be made for a short period and taken up as soon as outstanding accounts are paid, so that in cases of this kind the resultant has been usually only about 1 per cent more than the carload price. No discounts for cash are ever lost, and this in itself means a considerable amount on the cost of material in the course of a year.

The Contract Is Not Always to the Lowest Bidder

In the long run no one thing contributes more to the constructive advertising of a contractor than does thoroughly good work. This has been a permanent aim of the Beck company, and the result is evidenced by the fact that during a recent month more than $5,000 in contracts were secured, and on not one of these was the Beck company's bid the lowest. In this connection, a clear record on credit has also aided materially, for Mr. Beck is able to mail with his bid a waive-of-lien-rights from the jobber supplying the material. This is frequently of consequence in influencing the letting of the contract.

A large part of the work done is bid on from specifications, but as much as possible is done on a "time-and-material" basis. The advantage of the latter, by which the customer is able to make any or all changes desired without being charged an exhorbitant rate for extras, is pointed out to the prospective customer. As a result many jobs are being secured on this basis, which also involves less overhead expense.

By these various means the margin between cost and contract price is widened, and the overhead can not only be maintained at a low figure, but by proper cost records it is exactly determinable at all times.

Why the Large Appliances Need Personal Selling

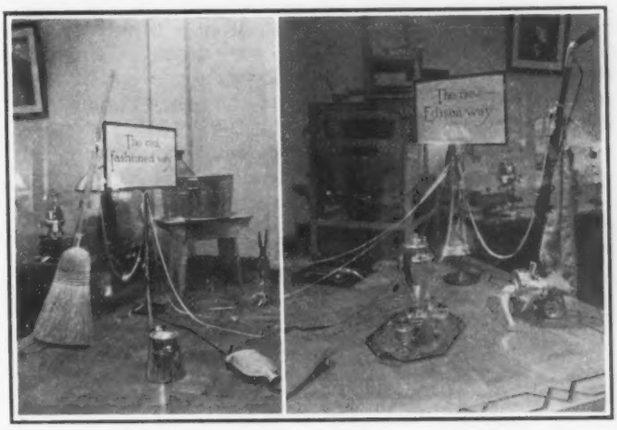
Vacuum Cleaners and Washing Machines Cannot Be Sold by Display Alone—Timely Hints for Spring Business in the Electric Shop

BY W. E. BAYARD

A PROMINENT manufacturer of electric suction sweepers told me this story the other day. He said: "I was in a city on the Coast awhile ago, in an electric store—a real electric store—where they are doing lots of business. They sell our cleaner, and I was just spending the day there to keep in touch. The women came rolling up in automobiles to buy a flat-iron or a toaster or a flashlight, or to give an order for a socket to be renewed or the wiring fixed, and the salesmen took good care of them and sold them things they had not come for. But I noticed that they seemed to fight shy of the vacuum cleaner and the washing machine. Not one of the salesmen said, 'Don't you want to look at this new washing machine, while you are here?' or 'Can't I show you this vacuum cleaner? It's the greatest home comfort that we have.' They seemed to be afraid because these are high-priced devices. So they did not sell any of them.

"That evening at dinner at the hotel the manager asked me if I wouldn't make some criticisms of the store and what I saw there. So I told him what I had seen, and do you know that in the following week they sold nine washing machines and twenty-one vacuum cleaners, just by talking to people about them."

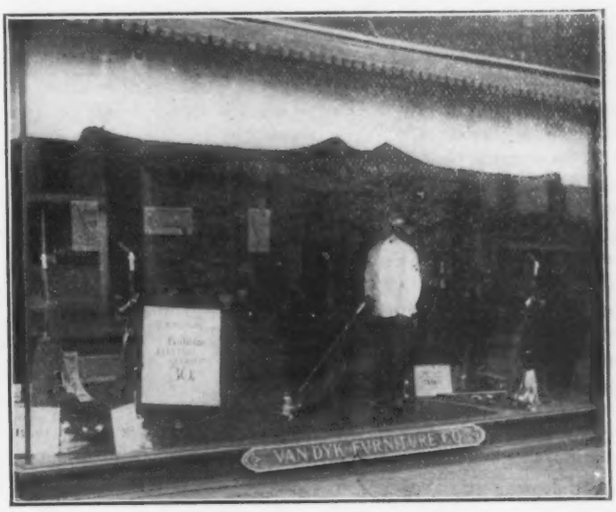
This is a most interesting concrete example of the power of salesmanship and the need for the education and the guidance of the salesman in the electric store. It is standard practice for an outside salesman as he goes from house to house to do his utmost to find out what the prospect actually needs in the way of electrical equipment, and to sell her something if he can. Yet he is working against a handicap. He cannot carry all the apparatus with him. But when a customer comes to the store, there is the entire opportunity at hand. The aim of every salesman should be to let no man or woman escape without being shown at least one appliance, other than that for which they came. It is a chance to spread the knowledge and appreciation of modern electric service, and its many applications. It is a chance to interest the visitor in something else and make another sale—if not right then, a little later.



THE TELLING COMPARISON AFFORDED BY TWO ADJACENT WINDOWS OF THE NEW YORK EDISON COMPANY

In the modern department stores no clerk or floorman ever thinks of asking any customer to look at something else, or to purchase anything at all. Those who visit the establishment are not annoyed by being importuned to buy. Presumably they have a purpose in the visit and display alone is depended upon for inducing other sales—how successfully we well know. But this is a department store and not a small shop, and what is good policy in one is suicide in the other. For the department store cannot be personal in its appeal. You buy this time from one clerk, and the next time from another, and if each salesman that you spoke to tried to sell you something it would be overpowering. You would never come again. But in the small shop, where you go in search for one specific commodity—drugs, jewelry, hardware or whatever it may be—the element of personal service is important and conspicuous. You know the merchant probably both by sight and by name. You like the salesman who waits upon you to be attentive, interested and eager to show you things and to explain them. What is good service in the department

THE CENTRAL CLEANER IN THIS WINDOW STANDS ON A REVOLVING PEDESTAL. A WINDOW IN THE BAG SHOWS THE WHIRLING CONFETTI. THE ACTION CATCHES EVERY EYE



THE NON-ELECTRICAL MERCHANT HAS BEEN QUICK TO SEIZE UPON THE DISPLAY VALUE OF THE ELECTRIC CLEANER AND FEATURES A LIVING DEMONSTRATOR IN HIS WINDOW

store is not good service in the small shop because of the difference of the two establishments.

And that is why the department store cannot successfully sell vacuum cleaners, washing machines and electric ranges. The sale of these large devices involves not only the expenditure of considerable money, more than $5 or so, it necessitates a change of habit in the home. For such appliances must introduce new fundamental methods of doing the household work, and before a man or woman will take a step of this kind the situation must be fully explained, they must be confident both that they want an electric cleaner in their home and that this cleaner is the one that they should buy. This kind of selling is not done in the department store; it can and should be done continually in the electric shop. For when a person is spending from $40 to $100 it is a matter worth his serious attention. He wants to know how the device is made and why that way. He wants to know its good points and the purpose of them. And just as the automobile salesman knows the full, long story of the gears and cylinders, and upholstery and all the rest that go to make the modern motor car, the man who sells a vacuum cleaner or a washing machine must know the principles of sweeping and of washing, and how and why the cleaner or the washer that he offers is the best. Not much explanation is required in the selling of an electric flatiron or a toaster or a heat pad, but the bigger apparatus must be sold by proper presentation of its merits.

It should be a rule in the electric store that, in so far as possible, every man and woman who comes in on any mission whatsoever should be shown some one appliance that the salesman thinks that he or she would be interested in. And because the cleaner and the washer and the range require more effort in the selling, just so much more pains should be taken to promote their popularity. For one range, one washer or one cleaner will do more to actually electrify the habits of a household than many small appliances that do not bring such vital benefits and influence.

And do not fail to talk to men about these things. Full 50 per cent of all the ranges and the washing machines are sold to men, and very nearly as large a proportion of electric suction sweepers.

The Electric Cafeteria at Sacramento, Cal.

Management of Restaurant Serving 700 Meals per Day Finds Cooking with Electricity More Economical than with Gas or Oil Distillate

At Sacramento, Cal., a new cafeteria serving 20,000 meals per month uses electricity for every possible process in preparing the food served to its customers. Vegetables are peeled and meat is chopped by motor power; a wide variety of dishes are cooked in electric ovens; the food is kept warm by electric heat, awaiting the customer's selection, and, finally, the dishes are washed by electricity. Electric cooking was installed in the Quaker Cafeteria by the sales staff of the Great Western Power Company in competition with both gas and distillate or stove oil. The electrical energy consumed by the Quaker Cafeteria averages 0.623 kw.-hr. per meal, and costs 1.21 cents per person served. An actual saving of $90 per month in the restaurant's meat bill effected through the lessened shrinkage of the meats when cooked by electric heat, as compared with oil or gas fuel, was one of the factors leading to the installation of the electrical equipment.

The new Quaker Cafeteria occupies a one-story building, 80 ft. by 80 ft. in ground plan, built especially for its present purpose. The structure is provided with a sprinkling system on the roof for cooling the interior in the summer, and has also an elaborate heating and ventilating system.

The dining room measures 60 ft. by 80 ft., and has a seating capacity of 250. The serving counter, which extends along the rear wall, is 45 ft. in length, and includes the steam table, 16 ft. long. This steam table, which is lagged with 2-in. magnesium blocks, contains 180 gal. of water, which is maintained at boiling temperature by six Simplex circulating water heaters, representing a total load of 8.75 kw. The heaters are to be provided with a time switch to keep them off the peak load.

For breakfast the portable equipment used on the counter includes an egg boiler, an egg poacher, a toaster, an 18-in. by 18-in. grid for frying bacon and eggs, an 18-in. by 18-in. grid for hot cakes, and two 4-in. waffle irons.

In the kitchen the Hughes bake oven used exclusively for pastries, handles the following material per week: 500 pies; sixty three-layer cakes; 105 pans hot bread; fifteen pans short cake; forty-five loaves nut bread; 250 cup custards; 600 baked apples; 250 apple dumplings; thirty-five puddings. The baker also has a Hughes range for heating milk and making frostings, and a Simplex 12-in. kettle for frying doughnuts.

For the meats, another smaller bake oven is provided. This oven turns out each week: 280 lb. rib roast; 60 lb. lamb; 40 lb. pork; 210 lb. stew; 100 lb. hash; 50 lb. bacon; 30 lb. ham; 50 lb. hamburger; 15 lb. meat loaf; 90 lb. turkey; 75 lb. chicken; 50 lb. duck; 450 lb. fish; 800 lb. roast potatoes; 100 lb. beans; 100 lb. macaroni.

For frying and for keeping the food warm after it is taken out of the main oven, there is provided a sixteen-hole Hughes range having six 12-in. 4-kw. open-type elements, six 9-in. 2000-watt elements, four 9-in. 1500-watt elements, and four 18-in. by 18-in. three-heat grids. On account of the great weight of the kettles and pans used, and the severe usage to which the range is subjected, it was found necessary to cover the heating elements with cast-iron grids. These grids are slotted to obtain both radiated and convected heat.

The warming closet for the dishes, which measures 4 ft. by 2 ft. by 5½ ft., is heated by two 1100-watt units. For cleansing the china dishes there is an automatic dish-washer operated by a ½-hp. motor. The potato peeler and the food chopper are both operated by a 1-hp.

Range	53.0 kw.	
Pastry oven	10.5 kw.	
Meat oven	6.5 kw.	
Small pastry range	5.0 kw.	
Frying kettle	2.0 kw.	
Two waffle irons	2.0 kw.	
Toaster	3.5 kw.	
Egg boiler	2.5 kw.	
Egg poacher	2.0 kw.	
Two griddles	7.0 kw.	
Warming oven	2.2 kw.	
		96.20 kw.
Water heaters on steam table	8.75 kw.	
Motors	4.5 kw.	
Sign and outside lamps	2.5 kw.	
Inside lamps	4.0 kw.	
		19.75 kw.
		115.95 kw.

motor, and the 2-ton refrigerating machine is driven by a 3-hp. motor.

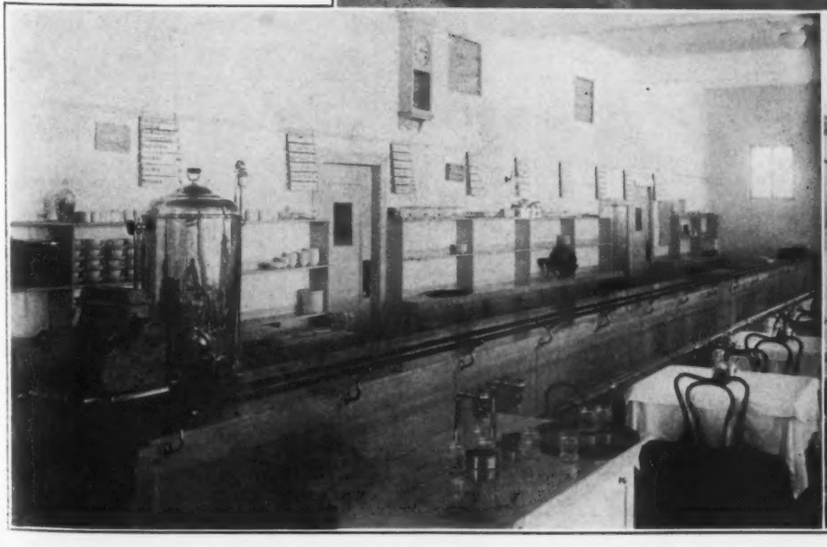
The total electrical equipment in the cafeteria aggregates a load of about 116 kw., as shown in the table on page 932.

The maximum demand of the cooking equipment is about 55 kw., with a load factor of 30 per cent, based on 730 hours per month.

The revenue from the cooking equipment averages about $190 per month. The monthly revenue, including that from motors, steam table and lamps, is about $300 per month.

A fireproof vault was built in the basement of the building in which two 50-kw. transformers have been installed in order that the voltage drop might be as small as possible.

Among the novel features of this electric cafeteria is the sprinkling system on the roof for cooling the two-story building in summer. The main kitchen range, pictured at the right, has a connected load of 53 kw. Below is presented a view of the serving counter in the dining room where electrically heated steam tables are installed. The pastry cook's oven is shown in the lower right-hand corner of the page.



SWITCH BOX WITH HINGED COVER—ONE OF THE PRIVATE LINES ACROSS THE FARM—THE MOTOR THAT MILKS FORTY COWS

Electricity on a Massachusetts Farm

Electric Motors Now Do Much of the Work of the Hired Man on Estate Near Greenfield—Use of Electric Milking Machine

A large number of farm customers are supplied with electric service by the Greenfield (Mass.) Electric Light & Power Company, operating in the Connecticut Valley. One of the most representative of these farms is that of Edward P. Swan, about a mile from Greenfield, on which a diversified and flexible service is illustrated. Energy is supplied by a 2300-volt, single-phase line feeding a group of farms in the vicinity through an independent transformer, which in turn supplies a three-wire, 220-volt secondary service carried to a distributing board in a shed. As the owner's foreman occupies these premises, a separate lighting meter is provided for his portion of the residence, another meter for the circuits lighting the various barns, sheds, etc., and a third meter for recording the energy utilized in motor applications on the farm. The total energy consumption averages about 200 kw.-hr. per month this year.

From the transformer, rated at 7.5 kw., the secondary leads are brought to the meter board, which is 8 ft. long and 2.25 ft. wide, painted with asphaltum and equipped with inclosed fuses and a main switch, with horizontal leads or buses from which the meter taps are taken. The power leads are carried away from the meter terminals in 1-in. conduit with various junction-box connections, at which taps are made for branches as needed, the conduit being grounded in salted earth. Each switch and fuse box is of metal and is provided with a hinged cover that falls closed by gravity unless held open, with inclosed fuses and with square-nut terminals on the service side of the switch to facilitate attaching the portable leads which carry power to the motor.

On the farm a 7.5-hp., single-phase Century motor is employed in sawing wood, cutting ensilage, etc. This is mounted on a wood platform 30 in. square and 2 in. thick, attached to two 6-in. by 6-in. wooden skids with chamfered ends, the skids being easily hauled about on the premises by attaching a horse and a rope to a 3-in. by 6-in. cross-piece. The motor is shown belted to a 24-in. circular saw mounted on a 1.5-in. steel shaft and equipped with a flywheel 2 in. thick and 24 in. in diameter. A rubber belt and a 5-in. by 5-in. pulley are used with the motor, which runs 1750 r.p.m. From the center of the motor shaft to the center of the saw shaft the distance is 15 ft. 6 in. Energy is supplied to the motor at a switch box on the shed wall through a flexible cable shown in the halftone. The motor also drives a No. 11 "Blizzard" ensilage cutter when required.

THE FARM TRANSFORMER AT THE ROADSIDE—A 7.5-HP. MOTOR THAT SAWS THE WINTER FIREWOOD AND CUTS ENSILAGE—MOTOR-DRIVEN PUMP SUPPLYING WATER FOR THE PICKLING TANKS

Other power applications include a 2-hp. motor-driven milking equipment built by D. H. Burrell & Company, Little Falls, N. Y., and a ¼-hp. pump used in filling cucumber vats with water. The milker equipment is mounted in a recess in the barn wall 4 ft. long, 30 in. deep and 3 ft. wide. About forty cows are kept, and one man milks four cows every fifteen minutes, compared with a milking time of approximately ten minutes per cow by hand. One man does the entire milking with the motor-driven equipment. The milker operates at 1800 r.p.m. Four additional men would be required without the electrically driven milking equipment.

Another illustration shows the motor-driven pump for the cucumber-vat service, the motor being a 220-volt General Electric outfit supplied with energy from a switch box as shown, via a private pole line. The pump has a suction lift of about 4 ft. from a brook near at hand and forces the water against a head of 12 ft. into three pickling tanks having a capacity of 400,000 pickles each.

The Value of Electric Signs to a Town

How the Salina Light, Power & Gas Company Conducted Its Campaign for the Distinctive Displays and Animated Signs that Have Made This Little City a "Bright Spot" on the Map of Kansas

BY B. E. JACK
New-Business Manager

ONE year ago a traveler coming into Salina, Kan., at night would have noticed little unusual about the place. In general appearance, it was a typical town of Kansas and the Central West.

But it took only twelve months to transform the commonplace Salina of the past into the brilliant little city of the present, without making any great change in its population. Nowadays, a traveler entering the town at night recognizes at once that here is a really "live," prosperous, progressive little community, despite the fact that only a few years ago it was a struggling little settlement just emerging from the wilderness. And the twelve-month change in appearance is due to Salina's attractive electric signs.

To be sure, we had a few signs before April 1, 1915, when the campaign was started, but those early signs were mostly of the small box transparency type. With only two or three exceptions, all of these early displays have been displaced with larger and better signs of the electric-lighted letter and animated type. Where the customer has been limited to a small sign, great care has been taken to have it "classy" and distinctive. As more central-station commercial men and sign manufacturers realize that a sign can be small and comparatively inexpensive to operate, and yet possess great advertising value through its uniqueness, they will begin to sell numbers of such signs, and these sales will in turn create a demand for larger displays. "Better have no sign at all than a poor one" has been the motto at Salina, and it has been the means of converting many of the merchants from the use of inferior signs to large animated ones.

The sign campaign in Salina has been carried on by the new-business department along the general lines employed in other Doherty properties, but without the assistance of any special men or any large amount of newspaper advertising. While we in Salina believe in newspaper advertising to a certain degree, we feel sure that the most effective way to advertise the value of an electric sign to a merchant is to sell one to his competitor, thereby arousing his business pride. We also talk to the "prospect" along the line of civic pride. This element of pride often amounts to more than all other mediums of advertising combined. It will make

THE ELECTRIC SKYLINE OF SALINA'S MAIN STREET WHICH HAS INTERESTED VISITORS FROM ALL PARTS OF THE STATE

EVEN THE LOCAL MILL IS A PROSPECTIVE SIGN CUSTOMER

him want an electric sign and a better one than his neighbors. When we started our campaign a year ago Salina had only six creditable signs. They were operated by a drug store, a 5 and 10 cent store, a theater, a hotel, a dry goods store, and a cigar manufacturer. We now have forty-six (not counting box signs), representing almost every class of business in town, and all of these displays are well-made, first-class, electric-letter signs, included among which are some of the largest and most unique flashing signs in the State.

The six signs we started with were pretty well distributed over the business district, which consists of four blocks. After an introductory series of circular letters and newspaper advertising along the lines mentioned, we selected the newest block as a starting base, pointing out to these merchants the fact that, since their end of the business district was the newest and the furthest from the hotels and the routes of the traveling public, they should avail themselves of every opportunity to bring their end of the business section into more prominence by assuming a more prosperous and attractive appearance. We induced them to paint their fronts, enter into window-dressing contests, increase their window illumination, etc., which all helped in the sale of electric signs.

Our first and most intensive efforts were spent on the two merchants who had the largest stores and who could afford the largest signs. We could have sold a few small signs before we sold these two, but we wished to set a high standard. We pointed out the fact to these two that since their stores were the largest in the neighborhood, good signs would mean much more to them than to the smaller merchants, and that considering the fact that they were better known through their newspaper, circular-letter and billboard advertising, they should have "landmark" displays in size and in general appearance in keeping with the importance of their stores and the impression they wished their stores to make upon the public. After these two signs were sold, we found it much easier to interest their competitors in the same block, and we also found that the latter could then be more easily interested in good signs. We made these merchants see that they owed it to their own businesses and to their end of the town to install signs that would do both credit.

In this manner we were able to install ten good signs in this block, most of these displacing small box signs or painted board signs. Among the number were three large animated displays.

By the time we had installed our last sign in the first block, merchants began to notice a change in things. People on the streets of evenings began to favor the better lighted section. Soon the merchants in the next block began to talk among themselves as to what should be done.

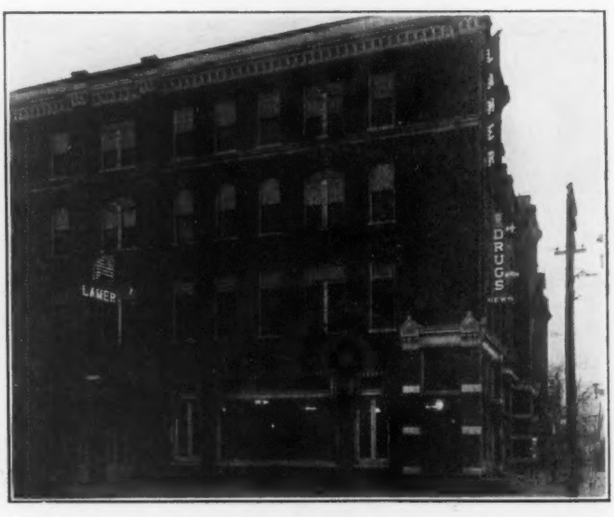
We at once began to point out to them how they were losing prestige as individual merchants and as a section of the business district, and that it was "up to them" to make their fronts and their block as attractive as the other. As with the others, we began in the largest stores first so as to set a high standard. We accordingly sold twelve signs in this block, and these averaged up to a better standard than those in the other blocks. During this time, a few more were sold in the first block. This gave us two blocks that were far ahead of the remaining two in electric displays, and the difference was so great that we were able to enlist some of the most influential merchants in the dark blocks in a regular campaign to make their part of the business district more attractive than the other.

The agitation back and forth caused a great deal of interest in electric advertising, its value to the merchant and to the town, and the comparative value of different signs—all of which added fuel to the campaign.

Every time a new sign was sold we helped the newspapers prepare a "story" about the new sign in particular. From time to time, also, the papers gave us valuable publicity in their news columns in accounts telling of the campaign and giving the merchants credit for their efforts to make Salina the best lighted city in Kansas—an achievement we think now realized!

At the present time we are selling an average of four signs a month, and our merchants now appreciate the value of electric advertising to themselves as well as to the town. Salina is being advertised everywhere as a result of its electric signs. Every traveling man and visitor has a good word for our beautifully lighted streets and stores. Of course, all this required work, and hard work, but it was well worth the effort. It would be well worth it to any town.

I often hear the question asked, "But how are you going to sell electric signs of any size worth while in a small town?" This attitude of doubt sometimes assumed by central-station commercial men explains just why signs are not often sold in such places, and is indeed often the only serious obstacle to securing this business. The electric-sign load, let it be remembered, is the most profitable business a central station can get, figuring revenue against load connected, and this sign business is just as easily secured in towns of from 5000 to 15,000 as it is in the cities.



A GROUP OF SIGNS ON A SALINA BUSINESS CORNER—WITH THE EVER-PRESENT ELECTRIC FLAG AT THE LEFT

MARKETING ELECTRICITY

A Department on Selling Service and Widening the Use of Electrical Energy

Hauling Garbage with Electric Trucks at New York City

The New York City street cleaning department now has in operation two 5-ton electric trucks for hauling garbage, in addition to its fleet of gasoline-electric tractors used in similar service. The General Vehicle tractor illustrated herewith is equipped with a steel body which holds 8.5 cu. yd. of material. This dumping body is used to discharge loads of rubbish into river scows which provide for its removal. The New York street cleaning department has also purchased two 2-ton platform trucks for general utility service.

HANDLING NEW YORK CITY'S REFUSE WITH ELECTRIC-TRUCK TRACTORS AND DUMP-BODIES

Such a tractor as that illustrated can be uncoupled from its trailer if desired, and another load substituted.

Open Windows, Flying Curtains and Electric Light—A Show Window Reminder for Household Safety at Cleveland

Coincident with the "clean-up campaign" which is being conducted in the city of Cleveland, Ohio, in the interest of fire prevention and safety, the Cleveland Electric Illuminating Company prepared an interesting window display to set forth the safety advantages of electric lighting in the home. The window was fitted up with a closet or wardrobe, at the side of which was an open window. An electric fan hidden just outside the window simulated March breezes and blew the curtains back over the light, which, of course, was readily distinguished from a gas jet in the minds of those who saw the display.

The door of the closet or wardrobe was also fitted with an electric switch, which operated the lamp within when the door was opened. A placard called attention to the safety of this automatic closet switch compared with the use of matches when searching for clothing or other objects in a dark closet.

The Meter Reader as an Electric-Range Salesman

The Smith's Falls Electric Power Company of Smith's Falls, Ont., has enlisted its meter readers as "scouts" to discover prospective users of electric ranges, during the electric-cooking campaign which the company is now pushing energetically. The meter men have been furnished with all necessary data on electric-range operation and costs, and are allowed a small commission on each sale made. This plan, according to George B. Frost, manager of the company, has resulted in bringing much new electric-cooking load onto the company's lines.

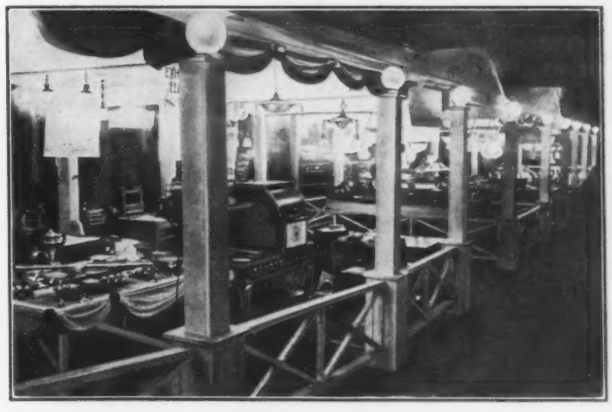
Since the electric company has no display room in the business section of the city, an arrangement has been made with a leading hardware firm on one of the main thoroughfares of the city, by which one of the hardware dealer's large windows is now regularly used for the display of electric ranges and other cooking appliances.

Topeka Contractors Co-operate in Joint Exhibits of Fixtures and Household Appliances

With the co-operation of local electrical contractors and dealers the Topeka (Kan.) Edison Company, through Robert Burns Basham, its general contract agent, recently staged a highly successful electrical exhibit in a city which had never before supported an electrical show of any kind.

Seven electrical contractors and the Edison company joined hands and engaged about one-half of the entire booth space at the manufacturers' and retailers' exposition early in the year, and constructed the electrical arcade shown in the accompanying photograph.

Definite booth space was not allotted to each contractor, but instead the area was divided up into exhibits of different classes of appliances, thus forming



TOPEKA'S FIRST ELECTRIC SHOW—A GLIMPSE OF SOME OF THE CLASSIFIED JOINT EXHIBITS BY ELECTRICAL CONTRACTORS

In this contractors' co-operative exhibit at Topeka separate booths were not allotted to each dealer, but the exhibit space was divided up into displays of different classes of appliances, including a vacuum-cleaner section, an electric-range section, etc.

a vacuum-cleaner section, an electric-range section, etc., with samples of each dealer's articles. The contractors placed great stress on their fixture display, the main object being to attract the attention of non-users of electric service. Another principal attraction was a 12-ft. round table with shelves built up in conical fashion and loaded with all manner of table appliances. The table revolved continuously and attracted a great deal of attention. Some 30,000 copies of special literature bearing the names of the seven contractors co-operating in the display and describing the fixtures and appliances exhibited were distributed during the show.

Familiarizing the School Girl with Electrical Appliances

How the Domestic Science Department of Washington Irving High School, New York City, Is Instructing Girl Students in Electric Cooking

That the girls who are being trained to be the housewives of to-morrow will have a clear knowledge and understanding of the various and important uses of electricity in the modern household, the domestic science department of the Washington Irving High School, Irving Place, Sixteenth and Seventeenth Streets, New

A DEMONSTRATION OF COOKING ON AN ELECTRIC CHAFING DISH, DOMESTIC SCIENCE DEPARTMENT, WASHINGTON IRVING HIGH SCHOOL, NEW YORK CITY

York City, maintains a thorough course in electric household appliances. The school itself is declared to be the largest and most completely equipped girls' high school in the world. Eight hundred young women are enrolled in the domestic science department, of which Miss Florence Willard is the head. Included in the elaborate equipment of electrical appliances which were installed under the supervision of the heating bureau of the New York Edison Company are more than twenty electric flatirons, electrical percolators, chafing dishes, tea kettles, toasters and grills.

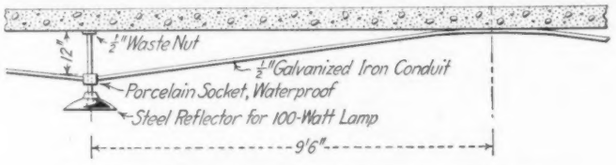
Among some women there has existed a strange and unfounded fear of things electrical. They actually shrank from touching anything electrical for fear of a shock. It has been the plan of Dr. Edward C. Zabriskie, principal of the Washington Irving High School, through this course in the domestic uses of electricity, to dispel forever in the minds of the girls and young women such incorrect and ridiculous notions and to teach them that electricity is their friend and servant in the household.

Wiring for Conditions of Moisture and Freezing in a Concrete Cold-Storage Warehouse

By F. C. Taylor

The Hilton Milling & Warehouse Company at Hilton, N. Y., has completed a new concrete cold-storage warehouse in which electricity is used for operating the necessary pumps, compressors and elevators and for lighting the plant throughout.

Since the moisture in the cold rooms would be alternately frozen and melted on the outside and inside of the conduit, run exposed, as this was, all precautions were taken to protect the conduit from rust and the wire from deterioration and possible short-circuiting



PROVISION FOR DRAINING CONDUIT TO OUTLET BOX

by accumulations of water in the conduit. To eliminate as far as possible any failure of the lighting system, it was specified that:

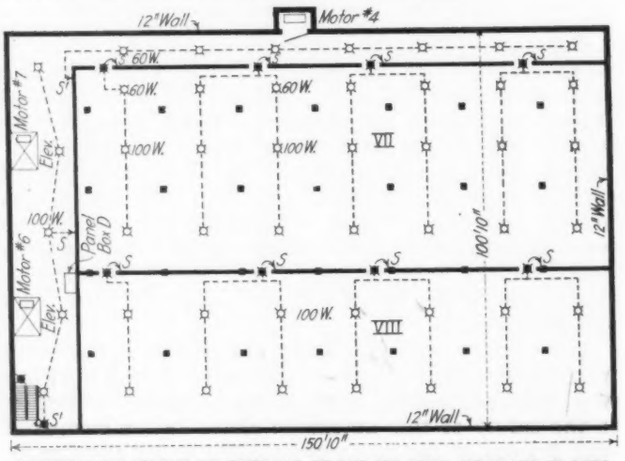
1. All conduit and fittings must be of galvanized or sherardized iron.
2. Long-base, porcelain, weatherproof sockets should be used. The No. 208 Freeman socket was selected for all the cold rooms.
3. All conduits should drain to the outlet or junction boxes, which should be drained by installing the box covers in a reversed position with washers placed between cover and box to provide space for drainage.
4. All wire used in the cold rooms should be single-conductor, double braid, and should be coated with shellac by a dipping process.
5. All joints should be shellacked.

The accompanying diagram shows the method of supporting the outlet boxes and reflectors, and the material used.

Pilot lamps were placed over the doors to the cold rooms to indicate whether or not the lamps inside were burning, and to eliminate the possibility of lamps being carelessly left "on."

At the points marked *S* on the plans rotary snap switches were placed. The switch used for this purpose was Type QKB manufactured by the Crouse Hinds Company, a design which proved to be easily drained and one in which the switch itself is well protected from mechanical injury.

Holophane D'Olier porcelain enamel-finish steel reflectors were used throughout the building.



LIGHTING LAYOUT OF TYPICAL FLOOR IN COLD-STORAGE PLANT

The Showcase as a Part of the Application Counter

The manager of a utility company in Michigan has removed a section of the marble application counter in the company's general office and has placed in the position formerly occupied by the solid counter a glass showcase of the so-called "silent-salesman" type. This showcase is kept stocked with appliances so that the attendants taking applications from new customers over the counter can at the same time point out the advantages of the devices.

Flag Lighting with Projectors at Peoria, Ill.

BY L. B. VAN NUYS

It has always been the custom at Peoria, Ill., to keep a flag flying on the dome of the county courthouse. Last fall the local Association of Commerce conducted a civic and industrial parade, and at that time the local Electric Club, as its part in the celebration, installed ten 500-watt flood-lighting projectors to illuminate the parade. At the close of the parade two of the projectors were directed upon flags on the top of the courthouse.

This installation so pleased the county officials that it was decided to make the installation permanent, and accordingly two projectors were mounted on corners of the main structure of the courthouse and their beams were directed at the flag on the dome. The projectors are placed on the corners of the roof diametrically opposite each other, and the beams are so directed that the flag is in the illuminated field regardless of which way the wind is blowing.

Some Practical Advantages of Motor Drive in the Woodworking Shop

The firm of J. Charles Teepe, Inc., New York City, one of the oldest manufacturers of high-grade wooden ware in the city, one year ago installed electric motors to drive the forty types of machines in its shop. The equipment consists of twenty-seven motors, aggregating 117 hp. The average consumption for a period of twelve months has been 2600 kw.-hr. per month, the installation of electric drive having resulted in a reduction in power costs of approximately 30 per cent.

In several cases where clear floor space around the woodworking machine was desirable, the driving motor for that machine is located on the ceiling of the next floor below. In all cases where the motor does not require a starting compensator the control switch is installed on the machine itself in a position most convenient for the operator. This arrangement eliminates delay in starting and stopping the motor and also saves energy, owing to the ease with which the operator may stop the motor when he leaves the machine.

As clearly shown in one of the illustrations, the starting compensators are, wherever possible, grouped on the support columns of the building. This arrangement is also a space saver and is employed wherever the distance from the machine is small enough to place a control within a reasonable distance.

L. J. Veeman, treasurer of the company, recently wrote to the United Electric Light & Power Company which furnishes the service, a letter of appreciation containing many points of interest to woodworkers. In speaking of the advantages obtained from the use of the new equipment, Mr. Veeman covers the following points:

"One-third more lumber is being rip-sawed with motor drive than was possible with shafting drive.

INTERIOR OF WOOD-WORKING SHOP, SHOWING STARTING COMPENSATORS GROUPED ON COLUMNS

"The quality of the work has been improved, due to the more constant speed of the tools.

"The usual 'kick' experienced in jointer operation has been eliminated.

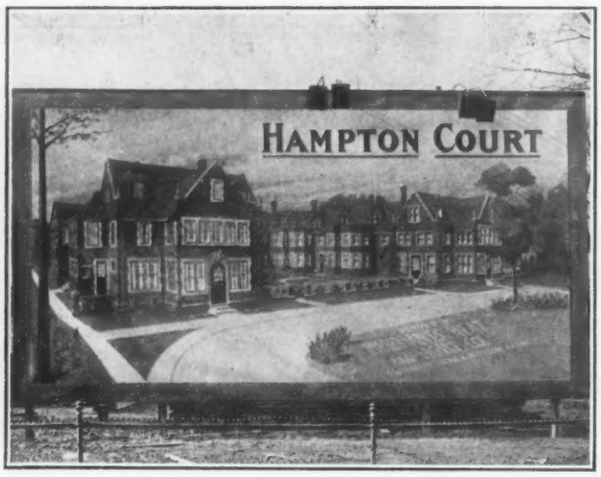
"The work on the variety molders has been improved and a higher production rate attained.

"The cost system of the shop has been made much more accurate by the possibility of measuring the load on each machine. When a new routing of material was adopted, in order to secure more efficient handling, the motor-driven machines were moved with minimum expense. In a shop of this kind where shavings, dust and sawdust abound, the squirrel-cage induction motors have proved an excellent investment, for they cannot possibly be harmed by any of these materials, and moreover, they are not in themselves a source of fire danger.

"Floor space has been increased considerably. Less artificial light is required. The cost of repairs is less."

"We have found," adds the author of the letter, "that when the demands of the business require machines to be speeded up, or to handle extra heavy work, satisfactory operation is maintained by the overload capacity of the electric motor as contrasted with the difficulty of securing any such extra power from belted shafting. Also, the ability of any or all departments to work overtime without depending upon a central engine room has materially lessened the overtime cost for power."

WITH THE INSTALLATION OF MOTOR DRIVE IN THIS SHOP IT WAS POSSIBLE TO ADOPT A NEW AND MORE EFFICIENT ROUTING OF MATERIAL THROUGH THE PLANT



THE LEGENDS ON THIS SIGN ARE VISIBLE ONLY UNDER CERTAIN COLORS OF ILLUMINATION

Color-Changing Signboard with Disappearing Legends

Utilizing the principle of the changing visibility of paints of various hues under lights of different colors, the Merchants' Heat & Light Company, Indianapolis, Ind., has erected a novel signboard on a plot where there will be erected a large new apartment house which is to use the company's service. Under an amber-colored light the sign presents the daylight view shown in the illustration. With the sky lighted by red lamps and the grass under green light, the letters on the sign disappear and the buildings appear in a rosy sunset. A blue light, on the other hand, causes the letters in the sky portion to appear as if painted in black and those on the grass to appear a delicate silver gray.

Co-operating with the Merchant on the Business Street

The Southern Idaho Water Power Company's local office and substation at Blackfoot, Idaho, are situated two blocks away from the main business district of the city. Since there are comparatively few passers-by on the street on which the plant is located, an arrangement has been made to co-operate in appliance sales with one of the local stores which handles small electrical appliances.

The accompanying picture shows the novel window display arranged in this shop for St. Patrick's Day. An electric range was placed in the middle of the window on a square of green and white linoleum, and in front of the range were set the vegetable cooker (removed from the range), an electric toaster, a percolator, an iron and a heating pad. On and about the range were arranged various aluminum cooking utensils handled by the store.

Large "shamrocks" were cut from green cardboard, their edges were gilded, and on the face of each was printed a brief description of some part of the stove or some utensil. These shamrocks were fastened face outward to the inside of the window, and from the stem of each was carried a green ribbon to the part of the stove or the utensil described.

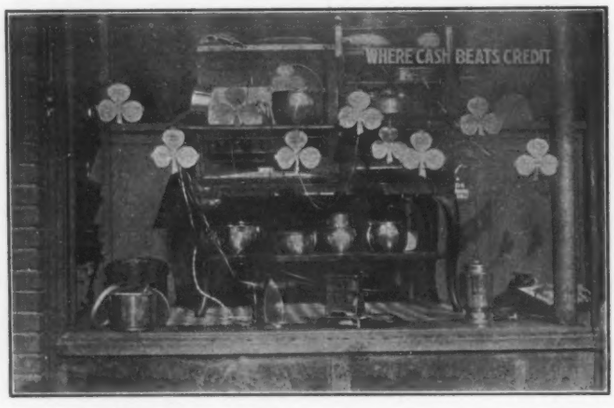
An "Active Room" Rate for the Rural Customers of the Milwaukee Electric Company

The Milwaukee (Wis.) Electric Railway & Light Company has recently introduced a "rural-rate" schedule under which a monthly charge of $2 is made for four or less "active" rooms, plus 40 cents per month for each active room in excess of the first four. This room charge includes energy equivalent to 7 kw.-hr. per active room per month, while a charge of 2 cents per kilowatt-hour is made for the excess. This rate applies to all requirements of the farm, including motors up to 3 hp.

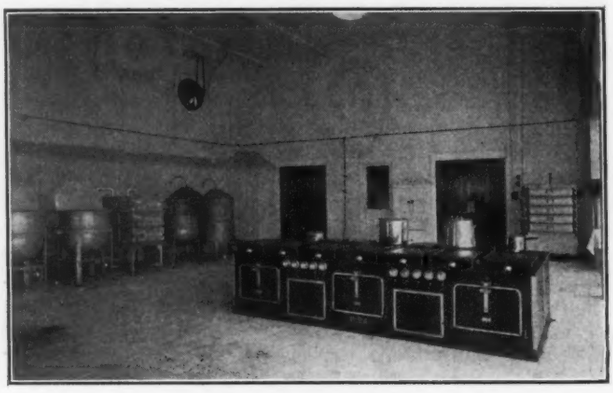
Electric Cooking in a Large State Institution

Following several years' successful experience with electric cooking on a smaller Simplex range in its new psychopathic department, the board of management of the Southern Indiana Hospital for the Insane at Evansville determined upon similar equipment for the general kitchen of the institution. The huge range thereupon installed, which meets the cooking requirements of several hundred patients, measures, as shown in the illustration herewith, 6 ft. wide by 12 ft. long. Being accessible from all sides, the range has a total working length of 36 ft. The three ovens on each side measure each 24 in. by 27 in. by 16 in. high, and each oven has a capacity for roasting twenty-four chickens or 80 lb. of meat. The top of the oven is also surmounted by seven frying griddles, each 18 in. by 24 in. in area. The range is also supplemented by a five-shelf electric oven, shown at the right in the accompanying illustration.

After several years' experience with electric cooking, the officers of the Indiana institution express themselves as well pleased with the performance of the electric range. The electric range illustrated consumes about 200 kw.-hr. per day, which is equivalent to about ¼ kw.-hr. per day per person.



A MAIN-STREET SHOW WINDOW "BORROWED" TO DEMONSTRATE THE ELECTRIC RANGE AT BLACKFOOT, IDAHO



THIS 33-KW. RANGE IN THE HOSPITAL AT EVANSVILLE, IND., DOES THE COOKING FOR 800 PERSONS

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

A Convenient Method for Replacing Series Incandescent Street Lamps

BY H. W. WATT
Engineer Electrical Distribution Westchester Lighting Company, Mount Vernon, N. Y.

Where series incandescent street lamps are installed at the end of long outriggers, attached to unstepped iron posts, it is customary to replace burned-out and broken lamps from a tower wagon or with a stepladder. The first method is quite satisfactory where there are hundreds of such posts in service. It frequently happens, however, that a lighting company has only a few of such posts to maintain, and these are often located several miles from the shop. In such cases the cost of operating a tower wagon is prohibitive, and the use of a ladder is awkward and introduces an element of danger. By means of the device shown in the accompanying illustrations the night inspector can quickly and easily replace a lamp from the ground.

The construction of the apparatus is shown in detail in Fig. 2. A pair of tongs is fitted with semi-circular clasps that close around the lamp base, holding it rigid and allowing no lateral motion. These clasps press against the top of the base rim when the lamp is being removed. In returning the lamp to the receptacle a lug on each jaw fits under the rim and forces the lamp into place. About ¾-in. play between the clasps and the

FIG. 1—METHOD OF USING DEVICE TO REMOVE LAMPS FROM THE GROUND

lugs permit of quick adjustment of the jaws in grasping the lamp base. It will be noted that no part of the devise touches the lamp itself, so that it is as easy to remove a broken lamp as one that is burned out or blackened. The tongs in the particular outfit shown have been rounded out to allow clearance for lamps of the shape now manufactured in sizes of 250 cp. and over. The tongs are opened and closed by means of a rod running the length of the stick upon which they are mounted. This rod is attached to an insulated operating lever at the lower end of the stick. A tension spring controls the operating lever so that lamp base cannot

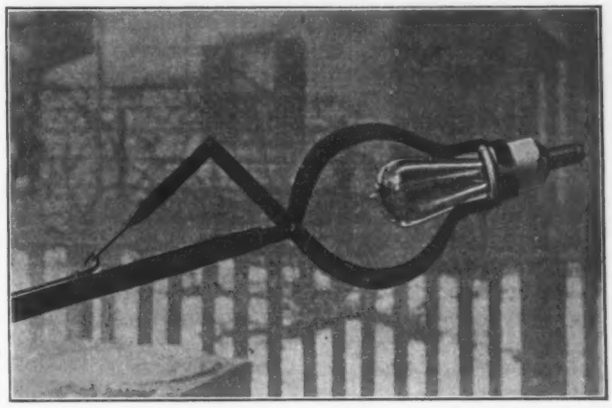


FIG. 2—CONSTRUCTION OF DEVICE FOR REPLACING STREET LAMPS

be released even if the operator removes his hand from the handle. The apparatus was made at small cost by a local blacksmith, who used the stick and operating handle of an ordinary tree trimmer in its construction. The writer has found the device a valuable time and trouble saver.

Effect of High Temperature on Lead-Covered Cable

BY PROF. J. O. KAMMERMAN
Pennsylvania State College, State College, Pa.

Recent articles in the ELECTRICAL WORLD on the subject of cables have caused the writer to formulate the following summary of tests made on lead-covered cable: A three-phase cable (No. 6 B. & S. gage stranded copper, 2/32-in. by 2/32-in. varnished cambric with 5/64-in. lead sheath) was installed in a tunnel about two years ago. The tunnel also contained high-pressure and low-pressure steam mains and the returns for them. The temperature in the tunnel has run as high as 180 deg. Fahr., and the average temperature is about 130 deg. Fahr. It was necessary to install the cable in this location, although the temperature at which the cable would operate under was known to be detrimental to its life. After eight months' operation a break-down occurred. On examination a small hole in the lead sheath was noticed at the point of failure, and it was apparent that considerable pressure must have been present under the lead sheath as the insulating compound was squirted at least 2 ft. from the cable. These break-downs continued to occur at intervals of from twenty-four hours to a month, and the same evidence of internal pressure was noticed in all cases where the circuit was opened before the cable was fused.

A new cable was purchased and installed in a separate tile conduit laid outside the tunnel. The added cost of the new conduit was offset by decreased depreciation on

the cable and annoyance due to interruption of service. The new cable received the usual voltage tests after it was installed. Also samples of the new cable, from the part left over, and samples of the old cable which had been in operation but not in the tunnel were given a break-down test. The purpose of these tests was to determine if the old cable which was not subject to the tunnel conditions was affected and how the new cable would be affected by extreme conditions.

Failure occurred between copper conductors at 18,050 volts and 13,100 volts on the old cable. A piece of this cable 30 in. long was bent till the ends met. After straightening again, this piece was tested and break-down occurred between conductors at 28,900 volts and 27,250 volts. These results are rather unexplainable, since the samples were identical and adjoined each other in service. Samples of the new cable (No. 4 B. & S. gage stranded copper, 4/32-in. by 4/32-in. paper with 7/64-in. lead sheath) also received the same tests. The unbent pieces broke down between conductors at 48,700 volts and 44,300 volts. Break-down between conductors and lead sheath occurred at 43,600 volts.

The samples were buried in snow for two hours before bending. When the paper cable was bent the paper could be heard cracking. The radius of the bend was 2¼ in. The maximum allowable bend in service should not be less than 12 in. radius, or eight times the diameter of cable. Rupture occurred between conductors at 27,300 volts and 29,920 volts and between conductors and lead sheath at 20,500 volts.

The tests seem to indicate that the cable subject to the high working temperature "broke down" owing to the surrounding conditions. The internal pressure may be caused by the heated insulating compound flowing to a small pocket, where expansion caused the rupture of the lead sheath. The bent samples show a decrease in disruptive strength but not so much as would be expected. A cable so bent and then placed in service would soon have a disruptive strength far below that indicated by the above test.

Firing Run-of-Mine Coal Under Varying Load Conditions

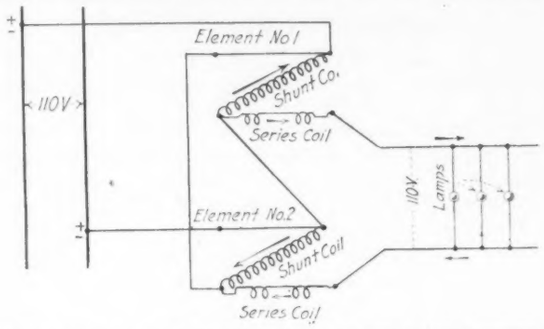
At a large Middle West generating station a method of handling coal has been devised which makes it possible to use both high and low-grade coals in boilers efficiently under all load conditions. Coal is purchased direct from the mine, some of which is good while other portions are of very poor quality. It is for the most part known as Southern Illinois coal and such that in many places it might be considered waste, being high in ash and volatile matter. The heating value ranges from 8000 B.t.u. to about 12,000 B.t.u. and the furnaces are especially designed to burn it. The coal as received is dumped into several hoppers distributed along the boiler room. These hoppers hold about 2000 tons each. Sometimes a car of coal is particularly poor, due to frost and moisture or grade of the coal. When this type of coal reaches the fireman during the period when loads are heavy, he immediately dumps it out of the container in the firing aisle and takes a better grade out of some other container. The low-grade coal is left on the floor until it can be used under favorable conditions.

Occasionally during boiler tests it has been found feasible to mix this poorer coal with the better grade, using enough of the good grade to make a mixture of about 30 per cent high grade and 70 per cent ordinary grade. This practice gives a more uniform fire, and results that are more nearly the average possible under ordinary firing and uniform supply of the particular grade of coal used are secured.

A Scheme for Connecting Watt-Hour Meters for Comparison or Test

By Henry Mulford

The accompanying diagram shows a method which the writer has used for connecting either two single-phase watt-hour meters or the two elements of a four-wire, two-phase watt-hour meter for comparison or test without disturbing the inside connections, or without either meter measuring the shunt loss of the other.



CONNECTIONS OF TWO SINGLE-PHASE WATT-HOUR METERS FOR COMPARISON SO NEITHER MEASURES SHUNT LOSS OF OTHER

This method requires that the load shall operate at full-line potential. If a so-called phantom load is used it cannot be connected through the series coils as a short-circuit would result unless one of the potential circuits is connected separately to the line. This would, of course, defeat the scheme of connections as shown. The connections as illustrated have been found useful by the writer in cases where the meter shunt-coil circuit terminals are not easily accessible.

Method of Filing Continuous-Curve Station Records

By George B. Brush

Operating Engineer, Des Moines (Iowa) Electric Company

The methods for filing continuous-curve station records described in the issues of the Electrical World for Feb. 5, page 323, and March 18, page 660, have been read with interest. Another scheme which has been found satisfactory by the writer is shown in the accompanying illustrations. The filing rack in Fig. 1 consists

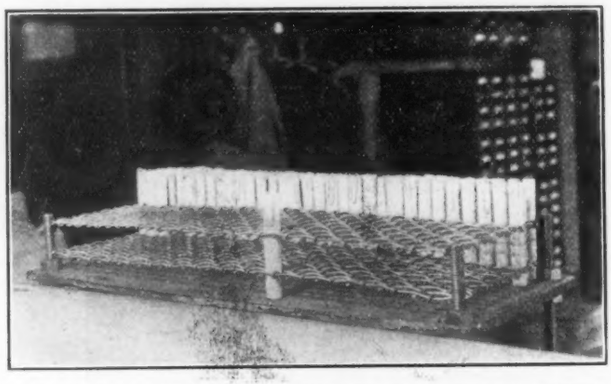


FIG. 1—CONSTRUCTION OF A FILE RACK FOR RECORDING INSTRUMENT CHARTS

of a board 23 in. long, 10.5 in. wide and ⅜ in. thick, four machine bolts, 3 in. by ½ in. with nuts and two pieces of woven wire approximately 8 in. wide by 21.5 in. long. The pieces of woven wire are made of No. 12 galvanized-iron wire and have a mesh about ¾ in. square. There are thirty-one meshes lengthwise and twelve crosswise. This makes it possible to file one

year's charts in a single rack with the charts for each month of the year in a single row.

In Fig. 2 this file rack is shown with a piece of heavy paper across the front. The small numerals at the top of this strip of paper readily show the day of the month corresponding to the meshes in which records are filed. This particular file contains charts from the

FIG. 2—FILE OF CHARTS FROM RECORDING VOLTMETERS FROM JAN 1 TO APRIL 4, 1916—RACK HOLDS ONE YEAR'S CHARTS

recording voltmeters on the station bus from Jan. 1, 1916, to April 4, 1916, arranged in their proper places. The size of this file is such that, if desired, it may be placed in the desk drawer of the man in charge of the records.

Energy Consumption and Operating Schedule for a One-Ton Furnace Connected to Central Station Lines

BY A. L. SCOTT

Sales Manager Edison Electric Illuminating Company, Lebanon, Pa.

On page 766 of the April 1 issue of the ELECTRICAL WORLD the engineering details in connection with furnishing energy to a 1-ton electric furnace in the Lebanon (Pa.) Steel Foundry were presented, together with characteristics of the furnace load and requirements in handling it from a station operating standpoint. There are certain commercial features of this load which are of interest. The average kilowatt-hour consumption for the 1-ton furnace has been 140,690 kw.-hr. per month since being installed in July, 1915. The output from the furnace has been from 6 tons to 8 tons of steel during twenty-four hours of operation, which the writer believes is a record performance. The average foundry furnace has an output of from 3 tons to 5 tons a day of twenty-four hours. The average rate which this load earns on a guaranteed basis is 1 cent per kilowatt-hour.

The contract on which service is furnished the steel foundry requires that the furnace be not used between 5.30 p. m. and 9 p.m. during the months of November, December, January, February and March, unless permission is obtained from the central station company before 5.30 p. m. on each occasion. The foundry also agrees that the power factor of the electric furnace shall not be less than 90 per cent. The power factor is determined from time to time by instruments furnished by the operating company working in conjunction with the customer. In case any test shows a power factor less than the 90 per cent agreed upon, the rate for energy is increased 1 per cent for each 2 per cent decrease.

Since this particular furnace has been in operation it has not been necessary to keep the furnace off the line during the time specified in the contract, and so far there has been no reason to inflict the penalty of the power-factor clause in the contract.

Daily Schedule for Coal Passers in L Street Station of Boston Edison Company

The accompanying schedule for coal passers is employed by the Edison Electric Illuminating Company of Boston at its L Street steam station to facilitate the carrying out of boiler-room routine duties. There are two coal passers to each watch, whose duties are to clean up around the plant, pull the siftings, keep the stoker engines oiled and clean, and perform other tasks.

TYPICAL SCHEDULE FOR COAL PASSERS—7 A.M. TO 11 P.M.

7 a.m.-8 a.m.—Get ice, sweep and clean alleyways. Remove clinker from fronts of ashpit doors.
8 a.m.-10 a.m.—Fill lubricators, grease cups on gears and front stokers, and clean up stoker engines.
10 a.m.-Noon.—Pull pits and screw down grease cups.
Noon-1 p.m.—Get ice, sweep furnace tops and remove all junk. Clean and polish all gages.
1 p.m.-2 p.m.—Remove clinker from fronts of ashpit doors, hang fire-cleaning tools behind the boilers and sweep the floors.
2 p.m.-3 p.m.—Clean tilting between the drum heads and the tube doors. Look over stoker engines and screw down grease cups.
3 p.m.-5 p.m.—Get ice, clean up engines and stoker gear and fill lubricators and grease cups.
5 p.m.-7 p.m.—Clean clinker from floor and front of ashpit doors. Close ashpit doors and sweep aisles and top of vestibule.
7 p.m.-8.30 p.m.—Sweep alleys behind boilers, over furnaces and clean bench and tool room. Screw down grease cups.
8.30 p.m.-9.30 p.m.—Clean between drums and wipe off doors.
9.30 p.m.-11 p.m.—Pull pits on No. 6 side, fill trucks, clean clinkers from the floor and sweep the aisles. Fill lubricators and grease cups.

In addition to these duties, as pointed out in an article entitled "Methods of Handling Boilers in 100,000-Kw. Station," April 8 issue of the ELECTRICAL WORLD, the coal passers are required to look after minor details of inspection, it being necessary to enlist the aid of every man in the plant from coal passers and firemen up to the engineer. Furnace conditions are watched by the water tenders, but boiler-room foremen are also constantly on the lookout for defects.

Cost, Rating and Effect of Current-Limiting Reactors

The curve of Fig. 1 shows the relative cost of current-limiting reactor units of different ratings based on the cost of a 10 per cent reactor. This curve, which was presented by W. M. Dann and H. H. Rudd in a recent paper before the Ohio Society of Mechanical, Electrical

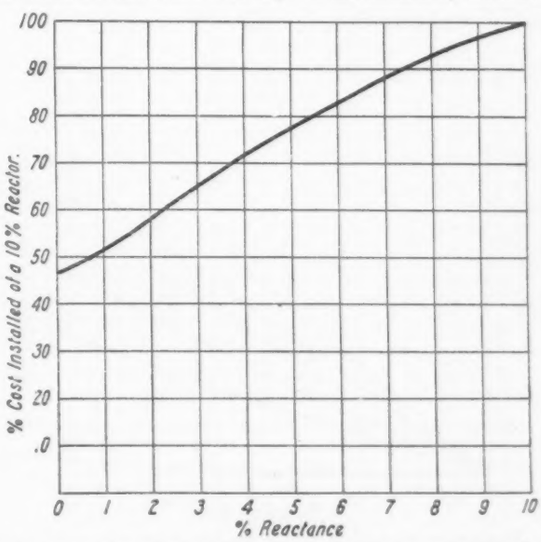


FIG. 1—RELATIVE COST OF REACTORS BASED ON COST OF 10 PER CENT REACTOR INSTALLED

and Steam Engineers, shows that the cost of current-limiting reactor units of different sizes is not directly proportional to their rating, and that they follow more nearly the cost characteristics of transformers and generators. The total expense of providing reactance is

not alone in the cost of the reactors themselves, the cost of providing space and of actually installing them being also a factor. It is therefore found that a 3 per cent coil can be provided with little additional expense over 1 per cent or 2 per cent coils.

The characteristics of a current-limiting reactor are definitely fixed by (a) the reactance expressed as a percentage of the normal voltage of the circuit, (b) the

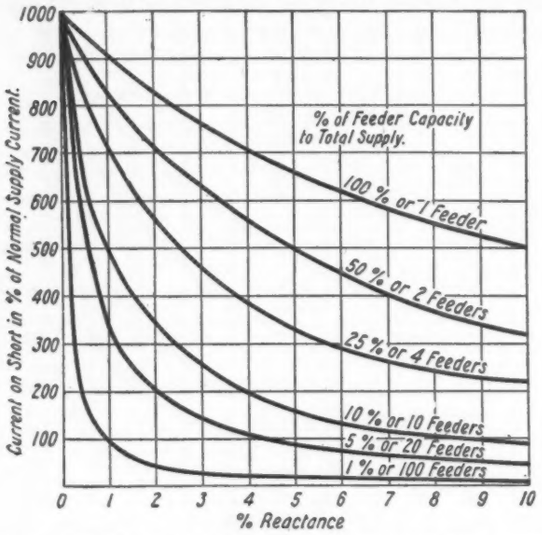

Current on Short in % of Normal Supply Current.
% of Feeder Capacity to Total Supply.
100 % or 1 Feeder
50 % or 2 Feeders
25 % or 4 Feeders
10 % or 10 Feeders
5 % or 20 Feeders
1 % or 100 Feeders
% Reactance

FIG. 2—EFFECT OF FEEDER REACTORS IN LIMITING SHORT-CIRCUIT CURRENT IN FEEDERS

characteristics of the circuit in which it is to be placed, (c) the temperature at which it normally operates.

For a single or two-phase circuit normal current will equal the normal kva. per phase divided by the normal line voltage. For a three-phase circuit it will be equal to the total normal three-phase kva. divided by 1.73 times the voltage between the wires. The normal voltage drop across the coil will be developed when normal current at normal frequency is flowing through the coil. This voltage drop will be the given percentage of the normal

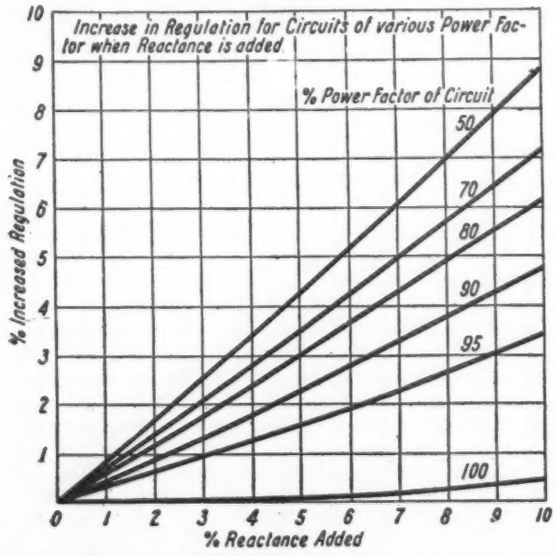


FIG. 3—EFFECT OF REACTORS ON VOLTAGE OF A SYSTEM, SHOWING AMOUNT IT IS LOWERED

voltage between wires in a single-phase or two-phase circuit or the given percentage of the voltage from line to neutral (the voltage between wires divided by 1.73) in a three-phase circuit.

Current-limiting reactors must of necessity carry the maximum overload current which the circuit is called upon to carry, and with a reasonable ultimate temperature. Reactors of this type, however, can safely operate at a higher temperature than would be safe for generators and transformers owing to open and well-ventilated construction and the use of materials not injured by high temperature. A temperature rise of 75 deg. C. under normal conditions represents common practice. The effect of feeder reactance in limiting the short-circuit current in feeders bearing various relations to generator capacity, based on a generator reactance of 10 per cent, is shown in Fig. 2. In Fig. 3 the amount by which the voltage of the system is lowered by the addition of reactance for several different power-factors is shown. As an example, if 5 per cent reactors are added to all feeders of a station and the operating power is 80 per cent, the generators should be excited to give 3 per cent more voltage to maintain the busbar voltage at the value it had before installing the reactors.

A Reason for Unequal Deterioration of Grates

BY R. I. ELKIN

It is usually found that the grates at the front of a boiler furnace deteriorate faster than those at the back. This condition is often annoying, and results in higher cost of operation than if the deterioration were more nearly uniform. The reason for the unequal deterioration does not seem to be generally understood, nor where the matter has received consideration have opinions always agreed as to the exact cause.

The most plausible reason for the more rapid deterioration of the front grates seems to be on account of the larger quantity of coal consumed above them per square foot of grate area, while the amount of air passing through the spaces, relative to the rate of combustion, is less. After a fresh charge of coal is applied to the fire the amount of air passing through the body of the fire is insufficient for complete combustion, and the auxiliary supply of air admitted through the grating of the furnace doors is of such a limited amount that it is only the fuel at the back of the doors that receives any benefit from this source. The result is that the front part of the fire reaches incandescence sooner than any other portion of the fire, with the possible exception perhaps of the narrow strips adjacent to the heated side walls. Air is admitted above the fuel, of course, but this air is not a factor in grate cooling, and the air supplied through the ashpit doors is retarded to an appreciable extent because of its direction of flow. Considering the matter from this viewpoint it is not difficult to imagine a strip of grate at the front of the furnace being subjected to high temperatures, whereas that portion of the grate 1 ft. or 2 ft. away may be comparatively cool. That there is quite a steep temperature gradient through the fire in this way seems to be indicated by common experience in many plants, and this is an explanation for the more rapid deterioration of the front than the back grates. To overcome the difficulty to a very large extent there appears to be two remedies. The one is to use bars of greater depth in the front, and in this way increase the cooling surface. The other remedy is to use bars having slightly closer air spaces between them for the rear grates.

While insufficient cooling surface of the grate bars is no doubt the chief cause of unequal deterioration, it may not be the sole cause. The trouble may be due to uneven or unequal firing resulting from carelessness or otherwise. The air will pass through the path of least resistance, and a hole in a fire constitutes such a path. Holes burn in a fire unless it is carefully watched. When they occur the fire should be leveled.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

An Absolute Thermopile

Part of an Extended Systematic Investigation of Instruments for Measuring Radiant Energy in Absolute Value Carried Out at the National Bureau of Standards

THE study of radiation laws was originally restricted to pure physics and was so much involved in highly complex mathematics that at first glance practical commercial applications of its principles seemed out of the question. But it did not take long for the radiation pyrometer and the optical pyrometer to develop and outgrow the realm of the scientific laboratory so that now, after scarcely ten years, commercial temperature control is carried out by means of these instruments in many chemical and metallurgical works and in the most varied industries.

At the same time it has become increasingly evident that the radiation laws form one of the most fundamental elements of physical science. It is appropriate that the Bureau of Standards should have taken up the subject for an extended systematic research. One of the chief needs in the measurement of radiant energy is a reliable radiometer which evaluates the observations in absolute measure. Such an instrument should be a primary one, capable of measuring radiant energy directly. Because of the lack of such a primary instrument, a calibration of radiometers against a standard of radiation is advocated; and such standards of radiation have been prepared by the Bureau of Standards. There are several apparently trustworthy methods for making measurements of radiation in absolute value. One of the problems undertaken in the bureau is the study of various instruments used in making these absolute measurements. In beginning the subject of radiometry in absolute measure, it seemed desirable to study instruments which might prove of use in general radiometric work (*e.g.*, useful as radiation pyrometers). The first communication of the bureau (in 1912) on this subject gave the results of a study of the "radiobalance." This is an ingenious device in which the radiometric receiver consists of a thermojunction which can be heated electrically. In this manner the heat generated in the receiver by absorbing radiant energy is neutralized by the well-known Peltier (cooling) effect, which occurs when an electric current is passed through a thermojunction. The results of the study of this instrument showed that while it has many good points it was not sufficiently reliable for a primary instrument.

The bureau then took up the study of the thermopile in order to determine its reliability as a precision radiometric receiver. The results of this work are given by W. W. Coblentz and W. B. Emerson in the Bureau of Standards' Scientific Paper, No. 261 (March 4, 1916).

The radiometric receiver is a very simple device, consisting of a very thin strip of metal, blackened to absorb radiation. Behind this metal strip, at a distance of 2 mm. to 3 mm. is placed a thermopile of bismuth-silver having a continuous receiving surface of tin. The thermopile is connected with an ironclad Thomson or a D'Arsonval galvanometer which serves merely as a zero instrument to indicate the rise in temperature of the metal strip.

The strip of metal serves three purposes—(1) as a receiver for absorbing radiant energy, (2) as a source of radiation which can be produced by heating the strip electrically, and (3) as a standard of radiation to test the galvanometer sensitivity, by heating the strip electrically by a standard current.

The use of a thermopile, separated from the receiver, makes it possible to use various receivers. The radiometric apparatus was therefore designed so that the receivers could be mounted over the thermopile as shown in Fig. 1. Each receiver, as shown in Fig. 1, is a complete unit consisting of an insulating base of slate *B* 3 mm. in thickness, to which are attached the copper electrodes, *EE*, 0.5 mm. in thickness, the receiver *R*, the potential terminals *PP*, the knife-edge slits *SS*, at the front, and the strips of copper *CC*, at the rear, which are used for the purpose of preventing radiations not intercepted by the receiver, from falling upon the thermopile. The platinum strips *R*, soldered to the electrodes and serving as receivers, are coated with platinum black. Receivers of manganin and of "therlo" and painted with lampblack were also tried. The various receivers differed in width from 2.5 to 8 mm. and in thickness from less than 0.001 mm. for platinum to 0.011 mm. for manganin. For further details of construction the reader must be referred to the original publication.

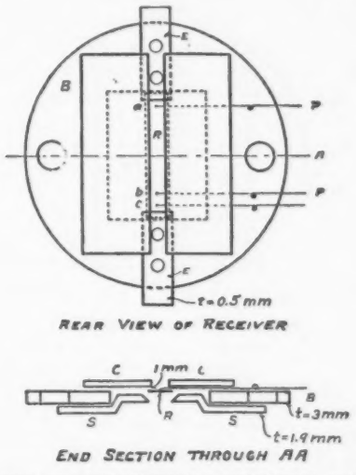


FIG. 1—RECEIVER OF RADIOMETRIC APPARATUS MOUNTED OVER THERMOPILE

The method of operation is unsymmetrical in that when the receiver is exposed to radiation the heating is produced in the lampblack surface, while in passing an electrical current through the strip the heat is generated within the receiver. However, from the data obtained with receivers differing ten times in thickness, and covered with different kinds and thicknesses of absorbing material, it appears that the manner of heating the receiver has but little effect upon the final result.

For any one receiver, operated under different conditions, the precision attained is usually much better than 1 per cent. The accuracy attained with the method of evaluating energy in absolute measure, as estimated by the departure of individual determination from the mean value, appears to be of the order of 1 per cent.

To this extent one can consider the present device a primary instrument for evaluating radiant energy in absolute measure.

The device commends itself as an instrument of precision because of its quickness of action, its freedom of surrounding conditions, its high sensitivity, and its simplicity of operation. It can be designed to suit the equipment of the average laboratory. The device can be much simplified and used as a radiation pyrometer.

Generators, Motors and Transformers

Transformer Diagram.—AD. THOMAELEN.—A mathematical article in which the author shows how by single application of the inversion principle it is possible to find almost without calculation the co-ordinates of the center and the diameter of the current circular diagram for the transformer. The author also emphasizes the advantages of the symbolic method.—*Elek. Zeit.*, Jan. 13, 1916.

Classification and Nomenclature of Motors.—R. E. HELLMUND.—After a definition of motor parts, the author gives classifications of motors with respect to kind of energy used for operation; with respect to the method of feeding the energy into the motor; with respect to the kind of energy used for exciting the main field; with respect to the member carrying the magnetizing currents for the torque field; with respect to the source of the exciting currents; with respect to the dependency of the torque field upon the load of the motor; with respect to the speed characteristics of the motor; with respect to the commutating field of the motor; with respect to power factor compensation. In an appendix several less familiar types of motors are briefly characterized and illustrated by diagrams.—*Elec. Journal*, April, 1916.

Lamps and Lighting

Calculating the Filament of an Incandescent Lamp; A Unit Lamp.—O. KRUH.—The construction of incandescent lamps is based on empirical data. The author shows that with our rather complete knowledge of the properties of the tungsten filament it is possible to predetermine the design of a tungsten filament lamp by calculation. The calculation is carried out for the normal (evacuated) tungsten lamp, and some notes are added on the spiral-wire, nitrogen-filled lamp. The author thinks that Violle's old idea of devising a unit of light on the basis of the use of a solid body raised by an electric current to a certain temperature may now be realized in a rather simple way by means of the tungsten-filament lamp. A 10-cp. unit lamp consuming 1 watt per candle-power may be designed, as shown in Fig. 2. He uses a filament of 0.054 mm. diameter and 107 mm. length. At 17.5 volts the current is 0.57 amp. The lamp operates at 1 watt per candle-power and gives 10 cp. Some precautions which must be taken in the construction of the lamp are noted.—*Elek. u. Masch.* (Vienna), Feb. 20, 27, March 5, 1916.

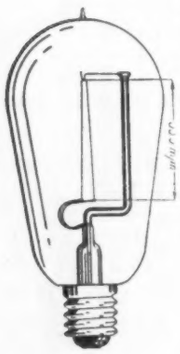


FIG. 2

Life Tests of Incandescent Lamps.—G. W. MIDDLEKAUFF, B. MULLIGAN, and J. F. SKOGLAND.—The method employed by the Bureau of Standards in the inspection and life testing of incandescent lamps for the federal government is outlined and a description of the power plant, the life racks, and the photometer is given. Particular attention is directed to the special equipment of the photometer. This includes a watts-per-candle computer and a recording device by which observed values of candle-power, watts, watts per candle, and actual life are recorded on a separate card for each lamp. These records are made in such a way that life at forced efficiency is corrected to life at normal without computation or reference to tables of factors. The procedure in actual measurement and testing is described with considerable detail.—*Scientific Papers, Bureau of Standards*, No. 265, March 16, 1916.

Photometry of the Gas-Filled Tungsten Lamp.—G. W. MIDDLEKAUFF and J. F. SKOGLAND.—The new high-efficiency gas-filled tungsten lamp introduces variables not hitherto encountered in the photometry of incandescent electric lamps. On account of the comparative broadness of the filament spiral and the dissymmetry of the filament mounting, there is considerable irregularity in the distribution of the light about the vertical axis. Consequently, when the lamp is rotated, as is commonly done in rating lamps at the factory, the light as seen in the photometer flickers so excessively as to render accurate measurements of candle-power practically impossible without the use of auxiliary apparatus. However, if two mirrors inclined to each other be placed back of the lamp, the flickering is so much reduced as to permit accurate candle-power measurements even at very low speeds of rotation. But this expedient does not eliminate the most serious trouble caused by rotation. It was found that at constant voltage both the current consumed and the candle-power are different when the lamp is rotating than when it is stationary, the current changing in one direction and the candle-power always in the opposite direction; that is, there is a change in the operating efficiency of the lamp. Furthermore, this change in efficiency may be either positive or negative, depending upon the speed, and it is about twice as great when the lamp is rotating tip up as when it is rotating tip down. Fortunately, from the standpoint of photometry, there is for each lamp in either position a particular speed at which the current and the candle-power have the same values, respectively, as when the lamp is stationary. Hence, with the lamp rotating at this speed its candle-power can be measured with accuracy in spite of its rotation. The speed for the above condition is practically the same for all lamps having the same number of loops in the filament; but for lamps having different forms of filament mounting it varies from lamp to lamp, being greatest for those having the smallest number of loops in the filament. Another peculiarity of the gas-filled lamp is that while it burns the blackening occurs, not all over the bulb in approximate proportion to the light distribution as in the vacuum lamp, but principally at the top of the bulb because the volatilized material is carried upward by the gas. Hence in making a life test a true measure of the reduction in total light during the life of the lamp cannot be obtained, in the usual manner, by mean horizontal candle-power measurements, but by determinations of the total flux or mean spherical candle-power. This is accomplished most rapidly and conveniently by means of an integrating photometer, such as the Ulbricht sphere, in which the lamp is measured stationary, and thus all the complications arising from rotation are entirely avoided. As to the cause of the variation observed in candle-power and efficiency when the lamp is rotated, it is concluded from the results of a number of special tests that the whole effect is produced by a change in the convection currents of the gas, a consequent variation in the temperature distribution in the bulb, resulting in a change in the resistance, and therefore a variation in the current and candle-power of the lamp.—*Scientific Papers, Bureau of Standards*, No. 264, March 16, 1916.

Color Screens.—PAUL D. FOOTE.—A paper in which an equation is derived representing as a function of the temperature of the black body source sighted upon, the "effective wave length" of any pyrometer color screen or system of color screens, or of color screens used in combinations with sector disk, nicol prisms, or absorption screens. Attention is called to the difference between the "effective wave length" and the "center of gravity" of the luminosity curve, as the so-called center of gravity of the color screen has been in the past sometimes considered the true effective wave length. When an absorption glass, nicol prisms, or sector disk is used with a pyrometer employing light which is not strictly monochromatic, such as the Holborn-Kurlbaum instrument, for the object of reducing the brightness of the sources sighted upon, the relation between the true temperature T and the measured temperature t is of the form $1/T - 1/t = A$ where A has been heretofore considered a constant. Actually it is shown, A varies rapidly with change in temperature of the source. The consideration of A as a constant may introduce errors as great as 40 deg. or 50 deg. at 3500 deg. if the absorption device is calibrated in the usual manner. When two or more absorption glasses are used together, it is not permissible to assume that the value of A for the entire system is equal to the sum of the values of A for the glasses used separately. It is shown that the combination of a sector disk and absorption glass gives a value of A which is practically independent of T.—*Scientific Papers, Bureau of Standards*, No. 220, March 13, 1916.

Generation, Transmission and Distribution

Tasmanian Water-Power Plant.—The hydroelectric scheme of the Tasmanian government is to utilize water-power derived from the Great Lake, and its conversion into electrical power for distribution at Hobart and throughout the island. It is expected that at least 26,000 actual horsepower at the turbine shafts could be generated for twelve hours per day, or 39,000 actual horsepower for eight hours per day, and it is believed that this could be increased eventually to 70,000 hp. Owing to the difficulty in obtaining delivery of certain parts of the machinery the completion of the installation has been delayed, but it is expected that the work will be completed in April, 1916.—London *Elec. Eng'ing*, March 23, 1916.

Polyphase Motors in Factories.—In a continuation of a long illustrated serial on the electrification of isolated factories the use of polyphase motors is taken up. The methods of connections are explained, also the voltage and current relations in polyphase systems, and the problems of speed variation and overloading are considered.—*The Engineer* (London), March 17, 1916.

Steam Turbines.—The replies received upon an inquiry on technical and commercial results in steam turbine operation are summarized. The summary covers the experience of ten years and sixty-five plants.—*Seit. f. d. ges. Turbinenwesen*, Vol. X, page 513; summarized in abstract in *Elek. Zeit.*, Jan. 13, 1916.

Traction

Rail Joints and Bonds in Electric Railways.—E. R. SHEPHARD.—An extended review of modern practice in the construction and maintenance of rail joints and bonds in electric railways. After a historical and general discussion of bonds and joints, the author gives a compilation of information submitted by operating companies together with an analysis of the data. It is emphasized that the whole subject of bonding is an engineering problem deserving of as much skill and attention as any other problem in connection with the operation of an electric railway. There is a marked tendency to get away from all types of soldered bonds. The problem of rail-bond maintenance is largely that of joint maintenance. No bond can be expected to last continuously on a loose and poorly supported rail joint. No one type of bond can be said to be better than all other types. Each has its advantages and disadvantages, and the selection of a bond for any particular service should be governed by the type of construction on which it is to be used, the grade of labor available for installation, and upon numerous other local conditions. While welded joints are being used more than ever before there is also a growing tendency to adopt improved mechanical joints and various forms of special joints, several of which are a combination of welded and bolted or welded and riveted joints. These special joints seem to be meeting the demands of service with less failures and better results generally than are attained by any of the standard types of joints.—*Technologic Papers, Bureau of Standards*, No. 62, March 15, 1916.

Installations, Systems and Appliances

Voltage Regulator.—A note on a recent British patent (5002, 1915) of the Igranic Electric Company and the Cutler-Hammer Electric Company for an automatic regulator for car-lighting circuits and other purposes designed to adjust the output of a generator to that required to charge the battery when there is no current consumption and to vary the standard of regulation and reduce the voltage when there is current consumption, of the type involving a vibrating relay energized by a shunt circuit and controlled by electromagnetic means in response to the conditions of the circuit. In this form of the apparatus a resistance is inserted in the shunt circuit of the relay, and not in series with the lamps, and the load switches are so arranged that the closing of any one of them short-circuits the resistance in the shunt circuit.—London *Elec. Eng'ing*, March 23, 1916.

Electrochemistry and Batteries

Hydrogen.—H. L. BARNITZ.—The author first discusses the principal commercial processes for the technical production of hydrogen. These are the Linde-Frank-Caro process which uses physical liquefaction of water gas; the contact process, known as the Lane or iron and steel process; the Riker-Wolter process, which is a chemical process for the decarburation of oil; and the processes using electrolysis of water. The author then discusses the applications of hydrogen in various industries, especially for making quartz glass, the use in balloons, the melting of platinum, the production of the synthetic ruby and sapphire, hydrogenation of oils, and the synthetic production of ammonia.—*Met. & Chem. Eng'ing*, April 1, 1916.

Electro-Analysis.—E. D. KOEPPING.—An article comparing various methods for the electrolytic determination of copper in copper-manganese.—*Met. & Chem. Eng'ing*, April 15, 1916.

Miscellaneous

The British Electrical Industry Before and After the War.—G. H. NELSON.—A report of a paper presented before the British Westinghouse Club. The author called attention to the extent to which American companies are taking up research work and referred to the research laboratory of the General Electric Company. This necessitates that the British not only consider Germany but America after the war. Of the total export trade of Germany 28 per cent went to the Allies before the war. In the opinion of the author the reasons why Germany has been able to make advances in commerce are: (1) Careful attention to manufactur-

ing organization and the application of research; (2) technical education; (3) careful attention to the selling organization in considering the requirements of the countries in which they want to trade; (4) the German banking system, embodying long credits for small security; and (5) the import duties, which assure manufacturers of their home markets. With respect to manufacturing organization, the author emphasized that this takes into consideration not only factory expenses but design of product. Germans have paid a great deal of attention to design. "When a German sets out to develop new plant reliance is not placed on the ideas of one man; all the departments are brought together, so that the most suitable design is produced from all points of view. In this country (England) designs are generally not tackled on a thorough basis, and consequently many designs are developed that the salesman cannot sell or the shopman cannot build. The author compares a German motor of 2 hp. weighing 130 lb. and running at 1200 r.p.m. with an old type of British machine giving an output of 1½ hp., weighing 185 lb., and running at 1200 r.p.m. The British machine was not designed for a fan or commutating poles, whereas the German machine was designed for both, and the armature had bigger slots and more copper in the armature. By altering the end brackets so that they were alike at each end, and providing sufficient space, a fan was introduced and other alterations were made, so that a 2-hp. motor was produced; and by a new design a 3½ hp. motor was made weighing 160 lb. running at 1200 r.p.m. Such a detail as making both brackets the same at each end of the motor is important for cheapening the cost of production." The author considered that there should be in London or some other big center an experimental and research bureau to which the results of experiments would be sent to be recorded, so that any firm could refer to this bureau for information before beginning to carry out tests, such information being sent free of charge. In regard to education, the application of science to manufacturing and commerce should receive greater study.—London *Electrician*, March 17, 1916.

Solving Maximum and Minimum Problems.—Arthur Mueller.—A brief mathematical article in which the author describes an analytical method for solving maximum and minimum problems, permitting in a simple way to determine approximate values which fulfill the condition that the first differential quotient or function in question is zero. The formula used is particularly suitable for the use of engineers.—*Elek. u. Masch.*, (Vienna), Feb. 27, 1916.

Book Reviews

Theoretical Elements of Electrical Engineering. By Dr. Charles Proteus Steinmetz. New York: McGraw-Hill Book Company, Inc. 368 pages. 191 illus. Price $3.

This work, written by one of the best-known of present-day electrical engineers and investigators, has just passed into a fourth edition, rewritten and radically revised. When the first edition was published in 1901 the author apologized for it by calling it an introduction to a work by him entitled "Theory and Calculation of Alternating Current Phenomena." Those who possess these two volumes and the four others by him which make up the set of six covering all the branches of electrical engineering, would scarcely consider the volume on "Theoretical Elements of Electrical Engineering" an introduction to any other volume of the set any more than he could consider the first volume of an encyclopedia the introduction for the set. It is a vital part of it and just happens to be the first volume by classification. So it is with Dr. Steinmetz's apology for the first edition of the book that is now considered a classic in literature on electrical engineering, a book the presence of which in an engineer's library is a very good index to the owner's familiarity and appreciation of the work of modern genius and the absence of which from a library reflects unfavorably upon his comprehension of the essential literature of his profession.

The changes made by the author in the fourth edition are decided, for the whole general plan of the volume has been changed. It now contains a more complete presentation of the fundamental principles of the general theory for the operation of electrical machines, with the material in the previous edition that does not fall under this head held for use in another volume which will also take the overflow of the same character of material out of the author's "Alternating Current Phenomena," now in preparation. Noteworthy among the changes having to do with general theory is the use of the crank diagram of vector representation instead of the polar diagram used in the previous editions. This change the author states in his preface has been adopted in conformity with the discussion of the International Electrical Congress of Turin. Dr. Steinmetz's way of discussing the fundamental principles of machine operation is most admirable for its simplicity. It is highly scientific and at the same time intensely practical. Take, for example, his discussion of the losses and efficiency of transformers. For those engineers who are not especially interested in the mathematics that show the core loss to be practically constant, loss curves for actual designs of transformers are given showing what may be expected under load conditions. Again, tables are given to show how to work out the all-day efficiency for two units, one used for lighting and power and the other used for lighting only. Such practical features of the book in the discussion of synchronous machines, direct-current commutating machines, synchronous converters, the transformer and the induction motor, make the work of great practical interest and value to every engineer, whether he be technically inclined or a practical worker looking for the essentials of machine operation.

Mechanical Drafting. By Charles B. Howe. New York: John Wiley & Sons, Inc. 148 pages, 166 illustrations. Price, $1.75.

This work is essentially a text-book for preparatory schools and other schools where mechanical drafting is taught. It does not seem to have been intended for self-instruction, for it is not well arranged for such use. It should, however, prove highly valuable as a text-book for the student, assisting him to a knowledge of the principles of mechanical drawing and their applications in the machine, architectural and engineering fields.

After a description of drafting instruments and their use, the principles of drawing and lettering are treated in a clear, concise way. Two chapters are devoted to geometry of drawing, after which follows a chapter on working drawings. The sixth chapter deals with machine drawing, describing in detail the conventions, etc., used in machine work. Plan drawing is taken up next, and several plates illustrate the various architectural designs and structural details used in building construction. Then follows a chapter on plot and map drawing and another on pictorial representation and sketching. The work is concluded with short descriptions of blueprinting and preparation of blueprint papers, ending with a word on blueprinting machines and appliances.

Books Received

ELECTRICAL ENGINEERING. First Course. By Ernst J. Berg and Walter Lyman Upson. New York: McGraw-Hill Book Company, Inc. 416 pages, 295 illus. Price, $4.

POWER FOR PROFIT. By Reginald Pelham Bolton. New York: The DeVinne Press. 210 pages. Price, $2.50.

ALTERNATING-CURRENT ELECTRICITY AND ITS APPLICATION TO INDUSTRY. Second Course. By W. H. Timbie and H. H. Higbie. New York: John Wiley & Sons, Inc. 730 pages; 357 illustrations. Price, $3.

CALL, RESOLUTIONS AND OFFICIAL PROCEEDINGS OF THE WESTERN STATES WATER POWER CONFERENCE, Portland, Ore., Sept. 21-23, 1915. Published by C. C. Chapman, Portland, Ore. 280 pages. Price, $1.

Readers' Views and Comments

Street Lighting on Cost-of-Service Basis

To the Editor of ELECTRICAL WORLD:

SIR: The plan for furnishing street lighting to a municipality on a "cost-of-service" basis, as outlined by Mr. Van Derzee in the April 1 number of the ELECTRICAL WORLD, is very interesting and should be particularly attractive to any municipality.

In my article published in your paper about a year ago on "Factors in Rate Making" reference was made to the difficulties which have been encountered in the past in negotiating equitable contracts between public service companies and municipalities for street lighting, and it was suggested that cities might install at their own expense, or assume the cost of, the special investment required for street lighting, and then purchase the necessary electrical energy from the public service company at the switchboard, in which case the city would be entitled to such a rate for electrical energy as could be obtained under similar conditions by any private consumer.

Under such a plan the city would absorb directly the fixed charges on all special street-lighting investment, while in its rates for energy consumed by the city the company would include not only the other items of cost, namely, a proper proportion of its fixed charges on its generating and other equipment used in supplying such energy, together with its operating expense at actual cost, but also very properly include in such rate a reasonable profit. For this reasonable profit I do not consider that it is sufficient to allow a certain rate of interest on investment as part of its fixed charges, but there should also be allowed a profit on its operating expense, involving as it does the use of working capital, which is also entitled to a proper return.

In Mr. Van Derzee's plan the company relieves the city of the cost of the original investment in special street-lighting equipment, in consideration of the city's agreeing to pay the fixed charges on same, including interest at a rate commensurate with the risk. Apparently, however, the "B" and "D" elements, namely, the joint and direct operating expenses, are included at actual cost without any profit or return to the company, either for its effort or for the use of its working capital.

Provided the rate of interest on the investment included in the fixed charges is adequate to cover a proper return on fixed capital commensurate with the risk in the business, the only defect apparently in Mr. Van Derzee's plan is failure to include a proper profit on the cost of operating to which the company should be entitled. With proper allowance for this item such a contract basis for street lighting should be entirely equitable, and should meet with general approval. ARTHUR S. IVES.

Determination of the Mean Effective Current for a Given Duty Cycle

To the Editor of ELECTRICAL WORLD:

SIR: I have been interested in the article "Analytical Determination of Mean Effective Current," by W. D. Peaslee in the March 18, 1916, issue of the ELECTRICAL WORLD and in the communication on the same subject by C. O. Mailloux in the April 8 issue.

As pointed out by Mr. Mailloux the fundamental idea underlying the method described in the above article is an old one, first used or at least first brought to the attention of electrical engineers by Prof. J. A. Fleming. I have had occasion to use the Fleming theorem to a greater or lesser extent both in my classroom work and in outside engineering practice for a number of years.

The Mailloux devices for integrating polar curves, for transforming graphic meter records of duty cycles to polar co-ordinates, and for reading the r.m.s. current directly from the graphic meter charts are interesting and no doubt are of great value as time savers when it is necessary to determine from graphic meter charts the r.m.s. current taken by equipment operating under variable load. It seems to me, however, that if the problem in hand is the determination of the r.m.s. current only, it has been attacked at the wrong point. The most simple solution, at least so far as the desired result is concerned, it seems to me, is a meter which will indicate directly r.m.s. current for any desired interval of time.

A number of years ago Prof. C. F. Scott made use of a commutator-type watt-hour meter in determining the r.m.s. current of some railway motors. The field coils of the watt-hour meter were connected in series with the motor under test, and the meter armature, wound with coils of low resistance, was connected in parallel with the motor field coils. The meter speed was, therefore proportional to the square of the current, and the dial readings divided by the time interval of the test gave the square of the effective current. The square root of this quotient was the desired quantity. Some of the objections to this method are: (1) The metering apparatus is not self-contained, (2) accuracy is affected by temperature changes of the field coils; (3) for the conditions under which it must operate satisfactory armature design is difficult to attain.

In the spring of 1914, Messrs. G. E. Adams and C. O. Gibbon, at that time seniors in the School of Electrical Engineering, Purdue University, working under my direction, attempted a solution of the problem. Following Professor Scott's watt-hour meter idea, a study of the feasibility of the watt-hour meter scheme was made. The great progress during recent years in mercury motor meter construction placed at our disposal a type of meter which for our purposes was markedly superior to the commutator type. The potential coil of a mercury-type watt-hour meter was replaced by one made up of a few turns of heavy wire. This winding was connected in series with the meter armature and the number of field turns adjusted so that the meter ran at full load speed with full load current through the armature. The dial readings of a meter so constructed are ampere-squared-hours. The square root of the quotient of the dial reading for a given test divided by the time interval of the test gives the r.m.s. current for the interval. By the addition of a clock movement and a specially constructed recording apparatus and scale, the meter was made direct reading. Further, for any time during a test the r.m.s. current from the beginning of the test up to that time could be read directly from the record. The apparatus as constructed was crude but gave quite satisfactory results. Its greatest objection seemed to be its complexity.

Some designers of mercury-type ampere-hour meters have made use of a series winding on the meter field, and then in order to make the meter read ampere-hours have used a braking system in which the braking torque varied as the square of the speed. However, I have never heard that they applied the idea to the measurement of the effective current required by a variable load.

The commercial development of a satisfactory meter for measuring the effective current of a motor or other piece of electric apparatus operating under variable load conditions would certainly simplify the work of application engineers. PROF. D. D. EWING.

West Lafayette, Ind.

W. R. PUTNAM

Men of the Industry

Changes in Personnel and Position—Biographical Notes

H. A. HOLDREGE

W. R. Putnam, chairman of the N. E. L. A. committee on the electric range, the work of which during the past twelve months has attracted widespread attention among central-station men interested in the introduction of electric cooking, is the sales manager of the Utah Power & Light Company of Salt Lake City, and has himself devoted particular attention to the local development of the domestic electric cooking load. Already some 600 electric ranges are in service on the Utah company's lines. Mr. Putnam is a graduate of the University of Minnesota. For a number of years he was manager of the electric lighting company at Red Wing, Minn., and Rapid City, S. D., and later acted as general superintendent of the Wisconsin-Minnesota Light & Power Company, at Menomonie, Wis., and Marinette, Minn.

Thomas Edwards has resigned as manager of the Arkansas Power Company, Malvern, Ark., to become chief engineer for Morrison & McCall at Brookville, Mo.

Claude S. Gordon, who is pyrometer expert for the Illinois Steel Company, South Chicago, has opened a private laboratory and will maintain a service department as consulting pyrometer engineer for a number of manufacturing concerns in and near Chicago.

E. F. Putnam, formerly assistant superintendent of the Naugatuck district of the United Electric Light & Water Company, has been appointed commercial agent for the Waterbury, Naugatuck and Seymour districts of that company, with headquarters at Waterbury, Conn.

W. H. Wood has been appointed superintendent of power plants in the electrical department of the Baltimore & Ohio Railroad, with headquarters at Baltimore, succeeding T. F. Foltz, resigned. Mr. Wood comes to the Baltimore & Ohio from the American Writing Paper Company of Holyoke, Mass., where he had charge of steam boiler plants. He was graduated from the University of Arts and Sciences in 1898, following which he was connected with the Standard Steel Company at Burnham, Pa. From 1899 to 1914 he was associated with A. C. Wood, a consulting engineer.

John Carl has been engaged as superintendent of the Greencastle (Pa.) Light, Heat, Fuel & Power Company, to succeed Claude Coffey, who has resigned.

C. G. Cox has been appointed St. Louis district sales manager of the McIntosh & Seymour Corporation, of Auburn, N. Y., with offices at 2086 Railway Exchange Building, St. Louis.

J. D. Scott, formerly power salesman of the Portland Railway, Light & Power Company, Portland, Ore., has been appointed assistant engineer in the office of O. B. Coldwell, general superintendent of that company.

Henry C. Lang, formerly with the estimates division of the Public Service Commission for the First District of New York State, has resigned to accept a position with the Graves Engineering Company, Inc., 25 Pine Street, New York City.

Dr. D. P. Mason, who has been a member of the staff of the San Joaquin Light & Power Company at Fresno, Cal., has assumed charge of the Midland Counties Public Service Corporation in San Luis Obispo and will be coast manager for the company.

Raymond W. Baker, formerly manager of the Union City Electric Light Company, Union City, Ind., who is also vice-president of the Interstate Electric Corporation of New York City, has been appointed president and manager of the Palestine ice and water works companies, Palestine, Tex.

James W. McCrosky, vice-president of the Latin-American Public Works Corporation, has just returned from an extended visit to Brazil, the Argentina, Uruguay and the West Coast countries where he has been making a detailed study of opportunities for the investment of American capital in public utilities and public works.

Clyde B. Aitchison, for nearly ten years a member of the Public Service Commission of Oregon, has resigned to accept the position of solicitor for the National Association of Railway Commissioners at Washington, D. C. His resignation will take effect about June 1. Mr. Aitchison first became a member of the Oregon commission in 1907, and was instrumental in drawing up the public utilities act that extended the operations of the commission. He spent a number of weeks in investigations at Hood River, Ore., leading up to the decision in the Hood River rate case, which was one of the first decisions ever rendered in the Pacific Northwest based on actual costs of service to various classes of consumers.

H. A. Holdrege, general manager of the Omaha (Neb.) Electric Light & Power Company, has been appointed State director for Nebraska of the work of collecting data on industrial preparedness for the Naval Consulting Board. Mr. Holdredge has for years been very active in the work of electrical bodies of Omaha and Nebraska, and was twice elected president of the Nebraska Section of the N. E. L. A.

John H. Lucas has been appointed president of the Kansas City Light & Power Company, Kansas City, Mo.

D. L. Mullen, of Lewiston, N. Y., has been engaged as superintendent of the municipal electric light and power plant at Mayville to succeed George Hardenburg, resigned.

P. F. Kelly has been appointed local manager of the Coast Valleys Gas & Electric Company, at Salinas, Cal., to succeed A. H. Rich, who will be transferred to another field.

A. C. Harrington, who has been general manager of the Marquette County Gas & Electric Company of Ishpeming, Mich., for the past three years, has tendered his resignation.

J. H. Mitchell has been appointed contract agent for the East St. Louis (Ill.) Light & Power Company. Mr. Mitchell was formerly power engineer of the Columbus (Ohio) Railway & Light Company.

Gillman W. Poore, formerly with the Edison Electric Illuminating Company of Boston, Mass., has been appointed superintendent of construction of the Commonwealth Water & Light Company of Summit, N. J.

G. D. Nicoll, who has had charge of the Ohio Electric Railway Company, at Zanesville, Ohio, for nearly five years, has been promoted to the position of superintendent of the Western and Southern districts of the company, with headquarters at Dayton, Ohio.

Philip J. Kealy, president of the Kansas City (Mo.) Railway Company, has been appointed acting general manager of the Kansas City Light & Power Company pending the appointment of a general manager of the corporation, which is the successor to the Kansas City Electric Light Company.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Electric Range with Reflector Type Heating Element

A line of electrically operated ranges consisting of five different types designed to meet the respective needs of large and small families, has been developed by the Hotpoint Electric Heating Company, Ontario, Cal. Four of the models are of standard gas-range design. Another is modeled after what is known as the gasoline-stove type. These ranges are equipped with open-coil reflector-type heating elements which are of steel and poreclain imbedded in steel. The truss form of construction provides rigidity, it is pointed out, and absorbs a minimum amount of heat. With the "Reflex Burners," as they are called, a working temperature is reached within fifteen seconds after the current is turned on, and an element with a diameter of 8.5 in. taking 1500 watts can produce the same amount of heat, it is declared, that is produced by a gas burner of standard size. The heating elements are accessible and the reflector plates rest on the crumb tray, which pulls out in the same manner as a crumb tray on an ordinary gas range. There is a space 1 in. deep between the coils and the reflector plate, so that it is impossible, it is claimed, for food to accumulate around the coils. This minimizes the possibility of disagreeable odors being produced and eliminates the risk of coils being subjected to excessive temperatures and consequent break-down through lack of air circulation. In case repairs are necessary, the elements can

ELECTRIC RANGE WITH OPEN-COIL HEATING ELEMENTS

easily be removed. Each heating element is controlled by a three-heat indicating snap switch. The ranges are finished in black enamel. The ovens of four of the five ranges brought out are lined with "aluminized" steel, and mineral wool is packed between the walls.

Electric Emergency Engine Stop Valve

The electrically operated emergency engine stop valve shown in the accompanying illustration is designed to close instantly in case of accident. It is made by the Crane Company, 836 South Michigan Avenue, Chicago, Ill. The valve can be connected to any electric circuit for which the solenoid is wound and can be controlled from any number of points desired. For instance, a

SOLENOID-OPERATED ENGINE STOP VALVE

governor may be equipped with a contactor so as to close the circuit in case of overspeed of the engine. Provision can also be made to operate the valve in cases of excessive voltage or excessive current demand, or when the steam pressure is too high or too low, as the case may be. The valve may also be operated with a rope pull and a mechanical release.

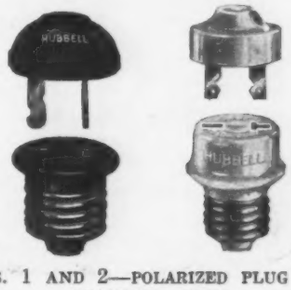
The general design of the valve is that of a swing check valve, with the flow of steam against the back of the disk, which is held open from the outside, allowing an unobstructed passage for steam when the engine is running. A lever is fastened to the end of the shaft connected to the disk, and a short length of chain with a weight on its end is securely pinned to the lever. This weight tends to close the valve. The design is suitable for steam pressure up to 250 lb. per square inch.

A by-pass valve is provided for equalizing the pressure on both sides of the disk when the valve is to be opened. When the engine is running, the disk is held out of the path of the steam by means of the cable attached to the lever. In case the valve is mechanically operated, the end of the cable is hung on a hook or attached to any convenient releasing mechanism. When electrically operated, the cord is released by pressing a button.

To reset the valve, the throttle valve on the engine must first be closed. The by-pass on the engine stop valve is then opened to equalize the pressure on both sides of the disk. The disk can next be elevated to the open position and the engine stop valve reset. The by-pass valve should then be closed. The emergency valve cannot be opened as long as steam can escape from the outlet side of the stop valve through the engine or to the atmosphere, because the stop-valve disk cannot be elevated until the pressure is equalized through the by-pass valve.

Polarized Separable Attachment Plug

With direct current it is sometimes important that the flow of current be always maintained in the same direction. With the increasing popularity of portable machines and tools the need of a convenient polarized separable attachment plug to assure correct polarity has been manifest, and to meet this need Harvey Hubbell, Inc., Bridgeport, Conn., has just placed on the market a small separable attachment plug with polarized contacts. The slots in the base are placed at right angles, and the knife-blade contacts in the cap arranged to correspond. With this plug it is impossible, it is pointed out, to reverse the polarity once it is established in the cap. According to the manufacturer, the term "universal" might well be applied to the device since it can be used either as a polarized plug, or if so desired the cap can be interchanged with various Hubbell T-slot receptacles of the surface and flush types, either for alternating current or direct current. The plug is of tough heat-proof composition, with a



FIGS. 1 AND 2—POLARIZED PLUG AND STANDARD PLUG

nickel-plated screw shell. The standard No. 5406 plug shown in Fig. 2 has been arranged to take either the porcelain cap usually supplied with it or the polarized composition cap of the plug described above and illustrated in Fig. 1.

Ornamental Floor Lamps

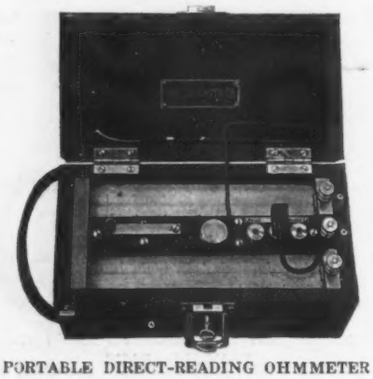
In the accompanying illustrations are shown several types of artistically-designed floor lamps mounted on wooden stands. The fixtures shown in Figs. 1

FIGS. 1, 2 AND 3—ORNAMENTAL FLOOR LAMPS MOUNTED ON WOODEN STANDS

and 2 are wired for three lamps while that shown in Fig. 3 is wired for two lamps. The stands are finished in antique gold and are ornamented with relief decorations. The shades are of silk and may be provided in various colors. The lamps are being placed on the market by the Crucet Manufacturing Company, 256 West Twenty-eighth Street, New York City.

Direct Reading Ohmmeter

An important factor in the proper operation of an electric signaling system is the resistance of the relay points, which should not vary beyond established limits. To meet the demand for an instrument for properly testing these systems, the Roller-Smith Company, 203 Broadway, New York, has brought out the "S. S." direct-reading ohmmeter, as it is called, shown herewith. The instrument is a modified form of a portable ohmmeter made by the above-named manufacturer, and consists of a slide-wire bridge having

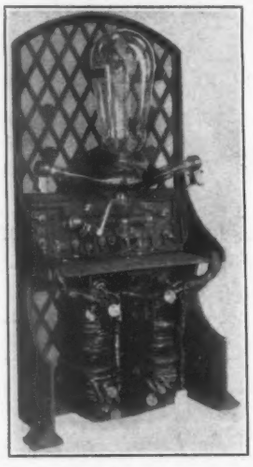


PORTABLE DIRECT-READING OHMMETER

a self-contained galvanometer of sensitive but rugged design, self-contained dry cells which are conveniently located for renewal, galvanometer key, stylus and self-contained resistors. It is inclosed in a hardwood case, provided with hinged top, latch and lock and leather handle. Three ranges are provided—0-1, 0-10 and 0-100 ohms, each on a scale 15 in. long, each scale being of a different color—namely, blue, red and black. Means are thus provided for making all relay point tests, as well as many other resistance measurements within the range of the device. An unknown resistance is measured by connecting it to points XX. The plug is inserted in one of the sockets marked "blue, red, black," and the stylus tapped along the wire that runs from end to end of the scale. At a certain point there will be no deflection of the galvanometer pointer. The resistance is then read off the scale, utilizing figures of color corresponding to the socket. If the first test indicates that a closer reading could be obtained with another range, it is only necessary to change the plug to another socket and find the point of no deflection as before. The instrument is 9.5 in. by 5 in. by 5 in. and weighs 5 lb.

Vehicle Battery Charging Outfit

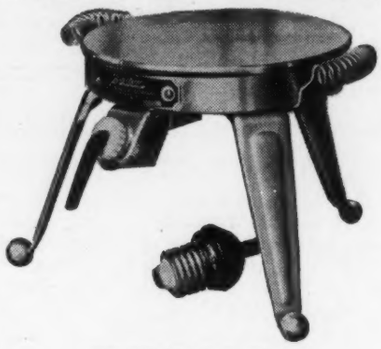
To meet the demand for a simple, convenient, reliable and economical means of charging vehicle batteries the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has developed a rectifier outfit which consists of a transformer-reactor and Cooper-Hewitt rectifier bulb mounted on a cast-iron frame. The transformer is designed to deliver, without the use of extra resistance or reactance coils, the gradually decreasing current best suited for battery charging. Terminals are provided for connecting the alternating-current lines and the battery circuits to the outfit. Fuses for overload protection are placed in both the alternating-current and direct-current circuits. Additional features are the simple starting switch and the two link connectors, by means of which the transformer connections can be changed to suit any particular battery pressure and line voltage within the limits of the outfit. The bulb is tilted by means of a handle at the front. Provision has also been made for mounting a voltmeter and ammeter on the frame.



VEHICLE BATTERY CHARGING SET

Small Electric Stoves

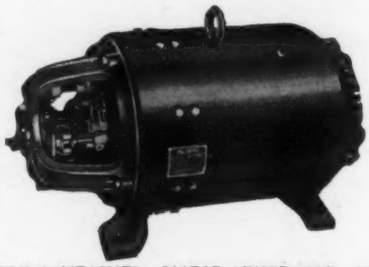
A line of light-weight electric stoves which are of use on the table, in the sickroom and in the laboratory, are being placed on the market by the Bigelow Company, Chicago, Ill. The Model A stove, as it is called, weighs 5.5 lb., is 6 in. in diameter, is highly nickeled and has insulated feet. It is provided with 6 ft. of cord. This stove is shown in the accompanying illustration. Another 6-in. disk stove brought out by the above-named manufacturing company is designated as its Model C device and is equipped with button-regulated heat control, permitting four changes of temperature.



SIX-INCH DISK STOVE

Motion-Picture Motor-Generator Set

For converting alternating current into direct current for motion-picture projection, J. H. Hallberg, New York, has developed the small directly connected motor-generator outfit shown herewith. Machines of the type illustrated have also been brought out for transforming direct current of comparatively high voltage to direct current of lower pressure. By means of special windings the outfit operates so that an arc can be maintained without the necessity of having a rheostat in series with it. These windings are so arranged as to counteract the effect produced by the shunt windings of the generator, so that the closer the carbons are brought together the greater will be the counteracting effect, actually reducing the voltage of the generator. If the carbons are brought together, and a short-circuit is thus established, the generator will stop delivering energy. The shaft upon which is mounted the direct-current armature with its commutator and the motor for the al-



SELF-CONTAINED MOTOR-GENERATOR SET FOR MOTION-PICTURE PROJECTION WORK

ternating-current motor, is large in diameter and very short, allowing for a small air gap between the pole pieces and the armature and thus increasing, it is pointed out, the efficiency, power factor and regulation. The shaft is supported by two ball bearings, one in each end casting. The eight pole pieces of the generator are built up of laminated steel, fastened inside of a comparatively light steel casting. Four of the pole pieces carry shunt-field windings and special compound winding. The other four, or smaller pole pieces, carry only series windings. These windings are insulated to withstand as much as twenty times the voltage which will be applied to them under normal conditions. The entire interior of the commutator and the armature, as well as of the rotor of the motor, is hollow, and upon the same shaft there is mounted a specially constructed fitting, shaped like the blades of a fan, for inducing air through the interior as well as around the exterior of the rotor, the armature and the commutator, thus insuring cool operation. A finger, which is adjustable, is provided for forcing the carbon brush against the commutator. Under ordinary circumstances, the manufacturer claims, the only renewals required are the refilling once a year of the lubricating grease chambers, for the two ball bearings, and from one to two sets of brushes per year. For two arcs with ratings of from 20 amp. to 40 amp. each, the accessories include a 15-in. by 18-in. slate panel, on which are mounted voltmeter, ammeter, special field controller, etc.

Automatic Motor-Driven Railroad Crossing Gate

The Briggs Automatic Gate Company, Hoopeston, Ill., which has been formed to manufacture an automatic, motor-driven railroad-crossing gate, has had one of its devices in service at a grade crossing on the Chicago & Eastern Illinois Railroad in Hoopeston since Sept. 26, 1915, during which period the gate has been operated about 7000 times. The mechanism actuating the gate consists of track circuits on the north-bound, south-bound and switch tracks, a system of relays, a storage battery as a source of energy, and a 0.25-hp. motor. The gate can also be operated on central-station energy instead of energy from a storage battery.

The diagram of connections herewith shows the track circuits. For both of the main-line tracks open-circuit operation is normally employed, closed-circuit operation being used for the switch track. Both types of circuits are arranged so that the gate will be operated regardless of whether the train in the danger section of track is operating in the established direction of traffic or against it.

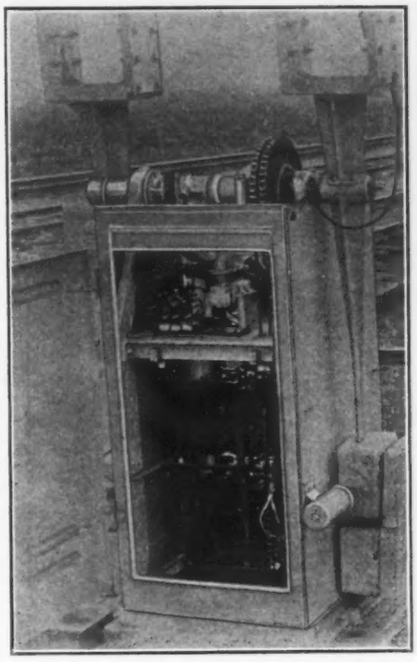


FIG. 2—MECHANISM FOR OPERATING CROSSING GATE

The standard which acts as a support for the movable gates also serves as a housing for the motor, the storage battery and a pole-changing device. Most of the relays are placed in a separate shelter beside the track. The manufacturer states that the gate can be raised or lowered in eight seconds, and that when storage batteries are used they will operate the gates without recharging for a period of thirty-five to fifty days. The manufacturer claims further that all crossings which would otherwise require the services of a watchman can be protected with less expense by gates of the motor-driven type.

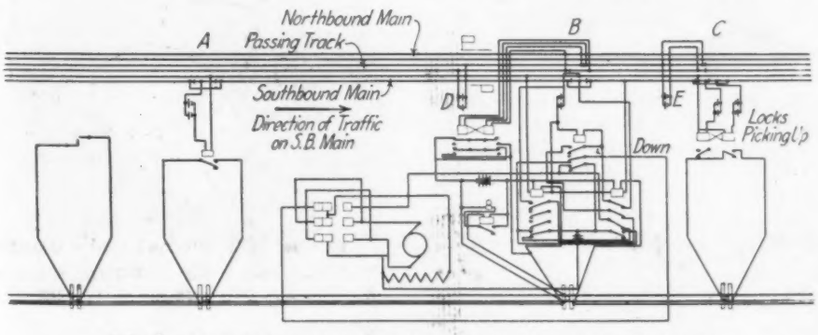


FIG. 1—DIAGRAM OF CONNECTIONS SHOWING TRACK CIRCUITS

Vacuum Cleaner with Attachments for Handle End

The "Pneumode" electric cleaner developed by the Bright Circle Manufacturing Company, Toledo, Ohio, is operated by a motor of the "universal" type which rests on the underside of the suction-pipe handle, normally within 0.5 in. of the floor. The floor tool, handle and cleaning tools are all formed of vulcanized fiber. A transparent indicator cap which covers the fan is readily removable. Turning this cap half way around cuts off the suction from the floor and lets it through the handle, or vice versa. By removing the cap, access is given to the fan. Because of the fiber construction and lack of metallic parts, the device weighs only 7 lb. The floor tool is swiveled at an angle on the handle and will run under and around furniture bases by swiveling the machine so that it will lie flat on its side. A carpet brush and polishing felt are combined in an invertible tool for attaching to the ordinary floor tool. The machine is equipped with rubber-covered rollers, which are mounted on spring supports stuck into the ends of the floor tool, and are removable at will. It is not necessary to oil the rollers, since they have arguta bearings. A paper liner fits into a silken cover for catching the dust. About once in every two weeks the paper liner is replaced, the liner and contents being destroyed together without being emptied. The dust-bag liner is also utilized as a circular, and is being issued by the above-named company as a semi-monthly magazine.

VACUUM CLEANER WITH SUCTION CONNECTIONS TO HANDLE AND FLOOR TOOL

Magnetic Rectifier for Battery Charging

In the accompanying illustration is shown a mechanically operated rectifier which is provided with an armature which vibrates between the poles of a permanent magnet. The armature thus acts as a magnetic switch, opening and closing the charging circuits and also preventing the discharge of the battery through the rectifier in case the alternating-current supply should be temporarily cut off. A special step-down transformer is utilized to cut the line voltage down to the proper charging pressure. The low-voltage charging

current is then passed through the rectifying element, consisting of a master-spring armature carrying two opposite sub-springs, to each of which is attached a copper electrode which makes and breaks contact with a carbon electrode. The transformer and rectifier are mounted on a metallic base and are inclosed in a neat case. The entire machine is rigidly constructed, small, compact and easily portable. It is provided with long, flexible charging wires so that it can be conveniently attached to any battery. The magnetic rectifier is advantageous, it is pointed out, due to the fact that it has only one moving part and that there is no sparking of the carbon and copper electrode. The carbon contact is, moreover, infusible and will not stick. A thumb screw is provided for adjusting the electrode for wear of the carbon. The charger is put in operation by screwing the extension plug into any convenient lamp socket and turning on the current. The positive and negative wires from the rectifier are then attached to their corresponding binding posts on the battery, when the ammeter will indicate the proper charging current. Where it is desired to charge several 6-volt batteries at one time or batteries of higher voltage, two or more rectifiers can be mounted on a panel with terminals for series or multiple operation. The rectifier is being made by the Ohio Electric Works, Cleveland, Ohio.

PORTABLE MAGNETIC RECTIFIER

Electric Washer with Telescopic Tub Stand

An electrically operated washing machine provided with a heavy cold-rolled polished-copper tub, tinned on the inside and double-seamed, holding 17 gal. of water, and having a capacity of six sheets, seventy-two towels or 120 napkins (or the equivalent amount of clothes) is shown in the accompanying illustration. The legs are of steel tubing strengthened with steel braces, copper plated and polished. The tub stand, when not in use, telescopes and folds back out of the way. The machine is operated by a ⅛-hp. motor, which may be utilized to drive both the washer and the wringer at the same time. The operating mechanism consists of machine-molded gears and ball bearings which are said to be practically silent while in action. In removing the clothes from the washer it is not necessary to throw off the power since raising the cover disconnects the gear and eliminates danger of accident, it is asserted. The two-roll reversible wringer is mounted on a malleable-iron frame, and is equipped with ball-bearing inclosed gears and reversible waterboard. The wringer is operated by one lever through the forward, reverse and "stop" positions. The cover of the machine is of Southern cypress. The machine weighs 150 lb. complete, and is being placed on the market by the Victor Manufacturing Company, Leavenworth, Kan.

METAL WASHING MACHINE

Automobile Radiator Heater

An electrically operated automobile engine or radiator heater has been developed by the Metal Specialties Manufacturing Company, 730 West Monroe Street, Chicago, Ill., to keep the engine and radiator warm in cold weather when the engine is standing in an unheated garage over night. It keeps the water from freezing in the radiator and maintains the engine warm enough so that it can be started readily when wanted. The heater is provided with a cord for attaching to any lighting socket. The heater is placed under the hood when in operation.

AUTOMOBILE ENGINE AND RADIATOR HEATER

Electric Sterilizers

Several types of electrically operated sterilizers have been developed by the Halverson Company, 111 Sixth Street, Portland, Ore., one of which, designed especially for the use of dentists, is 10 in. by 4.5 in. by 3.5 in. Another for use by physicians measures 15.5 in. by 6.5 in. by 3.75 in. in size. Each sterilizer is equipped with a contact plug and fuse screw which automatically breaks the contact and shuts off the current as soon as the water in the receptacle is exhausted. A new fuse screw can then be easily inserted with a pair of pliers or a screwdriver. Red signal lamps may be provided at the base if desired. The sterilizer is equipped with a removable tray which is automatically lifted when the cover is raised. These sterilizers are being made for operation on pressures of either 110 volts or 220 volts.

ELECTRIC STERILIZER WITH WARNING SIGNAL LAMP

Electrically Lighted Tablet Holder

A novel device of recent development which consists of a tablet holder equipped with battery and miniature lamp is shown in the accompanying illustration. A pad and pencil are provided with the holder so that writing can be performed in the dark. The device is made up of a rectangular metal frame rolled into a cylinder at one end and covered with leather. A small dry battery is inserted in the hollow cylinder and held in place by a detachable cap. Upon pressing a small slide at the end of the cylinder, contact is established, and the lamp throws its light, shaded and directed by a hood with metal reflector, upon the paper. Complete with lamp, battery and paper, the tablet holder weighs about 11 oz. The tablet holder is being placed on the market by the Supremus Manufacturing Company, 17 Park Row, New York.

PAD HOLDER WITH BATTERY-OPERATED LAMP

Electric Cooking Stove

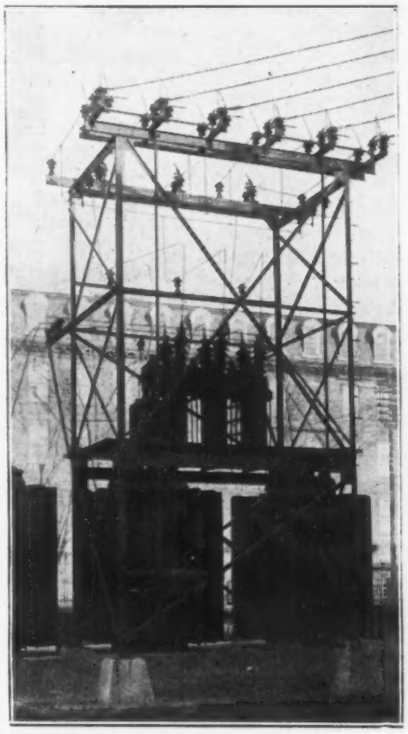
The cooking stove shown herewith is equipped with a heating element which is wound in a heat-retaining disk and which is installed inside the heat-insulated cooking compartment; therefore, according to the manufacturer, the Caloric Company, Janesville, Wis., every unit of heat generated is conserved. In the cover of the stove is a ventilating valve which acts as an indicator and shows when the current should be turned off. For instance, in cooking a quantity of food the food is placed in the cooking compartment cold and the current turned on. When steam appears at the ventilating valve the food has reached the cooking point, it is pointed out, and the current can be turned off. The heat retained in the compartment will serve to finish the cooking operation. A 5-lb. chicken or piece of beef will require the current to be turned on about forty-five minutes, it is asserted, before steam appears at the ventilating valve; the current is then turned off and the meat remains at the cooking point for three and a half hours. The unit is wound for 600 watts at 110 volts, and may be connected to any ordinary lamp socket. The lining of the stove is of seamless aluminum. The case is of metal lithographed in imitation golden oak. The cover of the stove is provided with a fastener which automatically takes up all wear, and jams the cover down tight, thus producing a steam-tight, air-tight cooking compartment. The cooker shown in the accompanying illustration is 31 in. high and weighs, complete, 113 lb. The cooker itself is 15 in. by 15 in. by 15 in., and stands on legs 16 in. high. It has a capacity of 8 quarts, and is equipped with adjustable cooking rack and cooking utensils. Another cooker of the same type has a capacity of 12 quarts, and is 17 in. by 17 in. by 17 in., has a total height of 33 in., and weighs,

ELECTRIC COOKING STOVE WITH HEAT-RETAINING COMPARTMENT

complete, 113 lb. A "Junior" electric cooker, as it is called, of 8-quart capacity, has also been developed by the Caloric Company. It is cased in heavy sheet iron, finished in aluminum bronze and equipped with seamless aluminum cooking compartments. No automatic current control device is provided with this model.

6000-Kva Outdoor Substation

The outdoor substation shown in the accompanying illustration is a simple high-voltage transformer station with a rating of 6000 kva. It is installed at Cohoes, N. Y., and serves power to one of the largest woolen mills in the world. The station was designed and built by the Railway & Industrial Engineering Company of Pittsburgh, Pa. The equipment consists of Burke horn-gap switches and lightning arrestors mounted on the top of the steel struc-



HIGH-VOLTAGE TRANSFORMER STATION

ture which carries the oil circuit breakers. The illustration clearly shows the method of carrying the wiring and connections to the three 2000-kva. Westinghouse transformers.

Twin-Type Electric Washer

A feature of the twin-type, electrically operated washer shown herewith is the pair of control devices provided with each tub. The mechanism is stopped or started automatically by raising and lowering the lid, or by means of levers at each end of the machine. If the operator wishes to use only one tub, the mechanism for the other one can be stopped with the lever without raising the lid, or the mechanisms of both tubs can be stopped without lifting the lids. The wringer revolves completely around in either direction and can be locked in any position desired. A wide, reversible drain prevents water from splashing on the floor when wringing. The mechanism is so constructed that it is impossible for the hands or clothing to become caught. The machine is 26 in. wide by 52 in. over all with the extension rack

TWIN-TYPE MOTOR-DRIVEN WASHING MACHINE

folded. The rack is 18 in. wide. Use is made of a platform of angle steel the legs of which are equipped with extension castings permitting the height of the machine to be adjusted to suit the operator. The drain pipes are threaded for hose attachments. The tubs are of 1.25-in. Virginia white cedar. A Robbins & Myers washing-machine motor recently described in these columns is utilized to operate the machine. This motor is provided with special end heads which have overhanging grids which protect the motor from water and at the same time allow thorough ventilation. The motor is mounted on a platform under one of the tubs and is belt-connected to the machine.

Electric Insert Water Heater

An electrically-operated heater which consists of a pipe 1.25 in. in diameter and 56.5 in. long which is designed for insertion in water tanks generally heated by coal or gas, has been placed on the market by the Lee Electric Radiator Company, 629 Peoples Gas Building, Chicago, Ill. The unit can be inserted in the opening through the top of the tank, as shown in the accompanying illustration; it is not necessary to disconnect the tank from the coal or gas heater already installed. The unit is threaded for 1 in. at the top. It is filled with an insulating, non-oxidizing fluid in which is submerged an open-resistance coil or heating element. Units are being made with single-heat elements rated at 500 watts and 750 watts, and three-heat units are being made with ratings of 1500 watts and 2000 watts. Tests have shown that water can be had at various hours ranging at a temperature of 110 deg. to 185 deg., or approximately 45 gal. every twenty-four hours at a temperature of 115 deg. (bath temperature).

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

Pennsylvania and New Jersey Consider Adoption of Lighting Code

An informal conference of the sub-committee on lighting legislation of the Illuminating Engineering Society with representatives of the Department of Labor and Industry of Pennsylvania and of the Department of Labor of New Jersey, was held at the Engineers' Club, Philadelphia, Pa., on April 10 for the purpose of discussing the various rules and regulations governing factory lighting as recommended in the code of lighting for factories, mills and other work places recently issued by the Illuminating Engineering Society.

The sub-committee on lighting legislation of the society was represented by L. B. Marks, chairman; C. O. Bond, C. E. Clewell and G. H. Stickney; the Department of Labor and Industry of Pennsylvania by Dr. John Price Jackson, commissioner of labor and industry, and J. P. Cronin; the Department of Labor of New Jersey by R. H. Leveridge, department electrical engineer; and as guests, R. E. Simpson and Samuel Snyder.

The sessions of this conference, both morning and afternoon, were devoted to an examination of the rules as submitted by the Illuminating Engineering Society. These rules were discussed thoroughly item by item, and minor changes suggested. These suggestions have been submitted to the committee on lighting legislation of the society for further consideration prior to their proposed adoption by the State departments represented at this conference.

Comparative Economy of Electric-Truck Service—Effects of Rising Price of Gasoline Noted

Compared with a gasoline machine of the same rating an estimated saving of $625 a year can be expected from a 5-ton electric truck when operated in a field for which it is suited, according to George H. Hudson, New England manager for the General Vehicle Company, who delivered an address on the subject before electric-vehicle and central station men at Boston on April 11.

Discussing the economies of such an equipment under present-day conditions, Mr. Hudson estimated the yearly operating cost of a 5-ton electric truck at $2,772, figuring energy at the comparatively high rate of 5 cents per kilowatt-hour, as against $2,824 for the "gas" truck, with gasoline at 25 cents per gallon. Fixed charges would come to $691 for the electric and $1,264 for the gasoline truck, allowing interest at 6 per cent, and depreciation at 10 per cent for the electric and at 20 per cent for the gasoline machine. This gives a total of $3,463 for the electric truck against $4,088 for the gasoline. The daily mileage of the electric truck was taken at 30.

Mr. Hudson pointed out that electric truck costs can be estimated with considerable accuracy in view of the guarantees of manufacturers regarding battery renewals, tire life and, in some cases, even mechanical renewals. In his estimate a tire life of twelve months with a run of 7000 miles, was assumed for the gasoline truck, and a life of eighteen months with a run of 8000 miles in the case of the electric. The electric truck can be operated satisfactorily by a driver paid $15 or $16 per week against $18 for the gasoline outfit. In one instance the speaker noted a weekly wage of $25 for the driver of a gasoline truck.

The high price of gasoline is now attracting the owner of the "gas" truck to the electric, within the latter's field. The fuel bills of one operator of four trucks in the New England territory were $1,800 last year, but on the present basis of gasoline these will be $3,000.

Tendencies in High-Voltage D.C. Practice Discussed by A.I.E.E.

High-voltage direct-current developments were traced, possibilities of standardization considered, and some of the factors that render very high voltages uneconomical pointed out at a meeting of the American Institute of Electrical Engineers held in New York City on April 14. The paper of the evening, which was entitled "High-Voltage D.C. Railway Practice," was prepared by Clarence Renshaw. In it attention was called to changes that have had to be made in direct-current motors, and improvements that can be made to simplify control equipment for operation on high-voltage or on combination low-voltage high-voltage systems. Methods of operating auxiliary apparatus and lighting circuits from the high-voltage circuits and relative values of automatic and manual change-over switches were touched on. The ultimate economic limits to direct-current voltages were also discussed, attention being called to the advantages of voltages that are multiples of the standard street railway voltage. Factors that should be considered in providing switching and contact equipment were also mentioned. In view of the multiplicity of operating arrangements with high voltages the speaker urged standardization.

The subjects were discussed by Frank J. Sprague, New York City; W. J. Davis, Southern Pacific Company, San Francisco, Cal.; W. B. Potter and A. H. Armstrong, General Electric Company; N. W. Storer and Calvert Townley, Westinghouse Electric & Manufacturing Company; B. F. Wood, United Gas & Engineering Corporation, and S. I. Oesterreicher, New York City.

Mr. Sprague traced the history of direct-current voltage increase, which he has consistently advocated. Mr. Potter pointed out that economic considerations must limit direct-current voltage increase. He also called attention to the fact that in one case where 3000 and 5000 volts were considered the initial cost was about the same with either, but the maintenance expense favored the adoption of the lower voltage. Reference was made to conditions existing on several electrified roads. The speaker concluded, however, that 3000 volts is not the limit to direct-current voltage, but a standard cannot be established arbitrarily without reference to conditions. Mr. Davis showed that the most desirable voltage depends not only upon the saving in copper, but upon the load factor of substations and the cost and number of locomotives required. Mr. Townley expressed opposition to establishing standard voltages or

limits beyond which to go as impeding progress. Mr. Storer said there is nothing to show that 5000-volt equipment will be more costly than that for lower voltages, and urged that engineers get together on standards. Others taking part in the discussion called attention to the importance of dependable operation, emphasizing its effect on maintenance expense.

Educational Advertisements Reprinted

The Commonwealth Edison Company of Chicago has reprinted in booklet form the twenty-seven educational advertisements which ran as a weekly series in all of the English newspapers of the city during the winter and early spring months. The booklet has been printed in response to requests from many sources for the complete series. The purpose of the series has been to tell in outline the story of central-station electricity supply in Chicago. The aim has been to do this simply, without exaggeration, and in brief installments. As is said in the first advertisement the series constitutes "A Report to the Public." The booklet is called "Electric Service in Chicago."

Public Service Commission News

New Jersey Commission

The Board of Public Utility Commissioners has directed the Consolidated Gas Company of New Jersey to adopt new regulations regarding the installation of conduit and other electric apparatus for service connection, similar to those of the Public Service Electric Company, which provide that a service connection not exceeding 30 ft. in length from the curb shall be made without cost to the customer, and excess to be paid for by the customer at the rate of 50 cents per foot. The board sustains the complaints brought by customers of Long Branch against the company in requiring customers to pay the entire cost of service connections, including conduit and cable from the curb line to building, cable terminal inside the premises and main-line switch and cut-out, with iron inclosure box. In its decision the board says: "We agree with this contention, particularly as the largest company in the State (Public Service Electric Company), whose business represents more than half of the total electric light and power business in the State, has adopted and filed with us rules and regulations which result in imposing no charge upon a customer served from an underground system, providing the distance to the customer's premises is not greater than 30 ft., measured from the curb."

Massachusetts Commission

The Public Service Commission has authorized the Bay State Street Railway to issue additional first preferred stock and bonds of the par value of $1,435,700 to meet floating indebtedness. Vigorous opposition to the issue of these securities was voiced at the public hearings by opponents to the important fare increase petition of the company now being heard by the commission. In a fifteen-page decision the board reviews its powers and duties with respect to security issue jurisdiction. It holds, among other things, that it has no authority to refuse to approve a security issue on the ground that it could be made to better advantage at another time; that no evidence appears upon which the commission can consistently disapprove the price now fixed by the stockholders, even though that price be lower than was authorized in permitting an unsuccessful issue last year; that in general the company's decision to issue both stock and bonds, within the law, to open up a broader field of investment for its securities, is a problem for the solution of which the management rather than the commission is responsible; and that it would be the duty of the board in any proceedings involving rates and service to prevent any injurious results to the public from any action of the directors taken at the expense of the company.

Illinois Commission

On April 1, 1916, the State Public Utilities Commission placed in effect conference ruling number 23 "Governing the Construction and Filing of Schedules of Rates, Tolls and Charges by Public Utilities Other Than Transportation Companies," *viz.*, electric, gas, water and heating utilities. Under the Illinois statute, all utilities are required to file with the commission, and also to publish, every rate, rule and charge under which it may desire to operate, before furnishing service thereunder. Conference ruling number 23 sets forth in detail the manner in which the rates and charges are to be compiled and filed, and also contains several typical standard forms of rate sheets.

The accounting department of the State Public Utilities Commission is actively engaged in the preparation of a tentative draft of rules and regulations covering a uniform system of accounts for electric, gas, water and heating utilities. A uniform system of accounts, similar to those established by other State commissions, it is felt, is urgently needed in Illinois. Such a uniform system of accounts has already been placed in effect for class I and class II telephone companies. It is expected that the accounting department, within a month, will be in readiness, so as to permit the commission to set a date for public hearing of the utilities affected by the new rules.

An application of the St. Clair County Gas & Electric Company for a complete rehearing of the Belleville Electric Case has been denied by the State Public Utilities Commission, except in so far as the commission's previous order pertained to the fixing of rates for municipal street lamps. A former rate of $68.50 per lamp per year had been reduced to $55 per lamp per year. The company claimed numerous errors, and petitioned to introduce further testimony as to the cost and the form of the rate. This the commission will permit.

Relative to rehearings, the commission states that it "is of the opinion that full test of the said rates should be made by not less than an entire year of operation under the new schedule, before a utility attempts to disturb the commission's order fixing rates. This commission is quite agreeable to a rehearing relative to revenues and to an equitable revision of rates, whenever it may be shown that, after an adequate trial, the rates which have been fixed by order are insufficient to compensate a utility for all of its proper charges and for all of its reasonable operating expenses."

Upon the question of excess capital stock tax, over and above a reasonable value of the utility's tangible property, the commission says: "In regard to an approximate $2,000 increase in taxes (in 1915) there is little apparent deduction to be made, other than to note that the record shows the item of taxes to be composed largely of a capital stock tax which would not exist if the respondent were capitalized at a reasonable valuation of its physical property, and were earning a reasonable return thereon. The consumers of Belleville receive no benefit whatsoever from expenditures devoted to payments of a capital stock tax in excess of the value of the property devoted to public use." The commission stayed the placing into effect of the low $55 annual rate for street arc lamps in Belleville, pending the decision in the rehearing.

Lecture on Water Powers of the United States.—H. J. Pierce of Seattle, Wash., addressed the Chicago Chamber of Commerce on April 12 on the importance of the United States Government taking immediate steps to pass such legislation as will protect investment in water power developments and attract additional capital in that direction.

Sedalia Closes Contract for Series Street Lighting Service.—The city of Sedalia, Mo., has closed a contract with the local lighting company, the City Light & Traction Company, for series street lighting service as follows: Thirty-seven 400-cp. Type C Mazda lamps on center-span suspension; 258 200-cp. Type C Mazda lamps, part of which will be center-span suspension and part on mast arms; forty 80-cp. Type C Mazda lamps to be located on short arms in the alleys through the commercial districts. Work of installation is to be under way by May 1 and completed by Aug. 1, 1916.

Union Electric to Have Employees' Club.—A. C. Einstein, vice-president and general manager of the Union Electric Light & Power Company, St. Louis, Mo., is fostering a movement for a club of employees in the company. A whole floor of the new addition to the present building, it is stated, will be turned over to club purposes, and will include a hall, with stage and balcony, capable of seating 600 persons, restaurant, billiard and poolrooms, bowling alleys, parlors and reading rooms. It is thought that this club will replace the present company section of the National Electric Light Association to a large extent.

Official Public Service Reports.—Publication was begun the first of this year on a new series of commission reports, called Official Public Service Reports, by the Law Publishing Company of New York. The reports are being published under the direction of the National Association of Railway Commissioners, under a resolution adopted at its San Francisco meeting in 1915, and include not only decisions handed down by State or municipal public service, railway and corporation commissions, but also decisions handed down by State and Federal courts reviewing or affecting commission decisions or relating to regulation of public utilities. Each decision has a syllabus, and each volume contains a subject index and a syllabus digest. There is also an annual digest and a legislative supplement, and the publishers expect to issue a supplementary digest of commission and court decisions handed down from 1907 to 1914 with references to the present edition. The reports are issued in two forms, namely, weekly advance sheets for $25 a year, and bound volumes for $4.50 each. The number of volumes per year will vary, depending on the number of decisions published, but for the present there will probably be about ten. The publishing company is also planning to issue the decisions handed down during 1915 in nine volumes, and one volume of digests, the work on which is well under way.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Electric Show for Pine Bluff, Ark.—An electric show has been planned at Pine Bluff, Ark., for the week of May 8 to 13.

New Electrical Code for Toledo.—The committee on rules, ordinances and by-laws of the City Council of Toledo, Ohio, has approved three ordinances which practically give the city a new electrical code. They provide for the inspection of electrical wiring and for fees for the inspectors. Further, they define the powers and duties of the inspectors and in a general way bring the requirements up to those of the State code. It is claimed that the schedule of fees will make the inspection department self-sustaining, but will bring no further revenue to the city.

Convention of Transformer Specialists.—Executives of the General Electric Company's Pittsfield (Mass.) factory, engineers of the transformer department and visiting delegates attended a convention of transformer specialists at Pittsfield last week. The convention closed April 13 with a dinner given at the Wendell Hotel by Mr. M. O. Troy, of the transformer department. Seventy-seven guests were present, each cooking a steak at his plate upon an electric broiler. Among those present were General Manager C. C. Chesney, of the Pittsfield factory; Chief Engineer G. Faccioli, and W. S. Moody. Following the banquet Edward Cheney, electrical engineer of the Public Service Commission, Second District, New York, gave an illustrated lecture upon "The Valuation of Electrical Properties."

First Suspension of Contractor's License Under New York City's New Electrical Ordinance.—The license of a Manhattan electrical contractor has been suspended for thirty days from April 15 by Commissioner Williams of the Department of Water Supply, Gas and Electricity, New York City, after the contractor's alleged failure to solder and tape splices and for other defects reported on work performed by him. This is the first suspension under the new municipal electrical code, enacted in July, 1915, and referred to in detail on page 712 of the ELECTRICAL WORLD of March 25, 1916. The city code not only contains detailed provisions in reference to the installation of wires and appliances for electric light, heat and power, but it also provides the commissioner with the power to require electrical contractors to obtain licenses from the department, which licenses, it is further provided by the code, may be suspended or revoked by the commissioner for cause.

Cincinnati's New Plant to Cut Generation Costs in Two.—At a hearing on the application of the Cincinnati Gas & Electric Company before the Ohio Public Utilities Commission for authority to issue $15,000,000 of bonds on April 5, Chief Engineer C. R. McKay of the company testified that the cost of production of energy at the switchboard will be reduced by one-half if the proposed new generating station is built. The plant at present is loaded to capacity, he said, and the new station will enable the company to accept much new business. Conditional contracts, Mr. McKay said, have been made for generators costing $400,000 and for boilers and stokers that will cost about $625,000.

Illinois Commission Publishes Monthly Bulletin.—On April 1 the State Public Utilities Commission of Illinois initiated the publication of a regular monthly bulletin, which will detail news items relating to the activities of the commission. Brief accounts of cases under consideration, together with a brief of all orders entered, will constitute a large portion of the articles published from time to time. The first number contains, among other articles, an extended review of the commission's conference rules and regulations pertaining to public utilities in Illinois. The secretary, R. V. Prather, Springfield, Ill., upon application, will place the names of interested utilities on the mailing list.

Itinerary of Eastern Inspection Trip of Ohio State University Engineering Students.—The fourth-year mechanical and electrical engineering students of the Ohio State University accompanied by four instructors left Columbus, Ohio, on April 13 on an Eastern inspection trip to last a week. Two days were spent in Cleveland, two in Pittsburgh, two at Niagara Falls and one in Buffalo. Each student was provided with a copy of a booklet entitled "Things to Be Observed and Noted," which was prepared with the intention of guiding the students' attention along instructive lines. Among the places visited were the Westinghouse group of industries at Pittsburgh, United States Bureau of Mines, and Bureau of Standards, of Pittsburgh, Carnegie Steel Company, Oliver Power Plant, Ontario Power Company, Hydroelectric Power Commission of Ontario, Canadian Niagara Falls Power Company, Toronto Power Company, Niagara Falls Power Company, Acheson Graphite Company, The Carborundum Company, Niagara Falls Hydraulic Power & Manufacturing Company, United States Light & Heat Corporation, Buffalo General Electric Company, International Steam Pump Company, Otis Elevator Company, Electric Controller & Manufacturing Company, National Lamp Works of the General Electric Company, Lincoln Electric Company, Peerless Motor Car Company, American Steel & Wire Company, Cleveland Electric Illuminating Company, National Carbon Company, Cleveland Railway Company, Cleveland Municipal Electric Light Plant, and many others.

Rochester Jovian League.—At the regular meeting of the Electric Club, Jovian Order, held at Hotel Seneca, Rochester, N. Y., on April 6, Joseph P. Haftenkamp spoke on the "Gas Lighting Industry."

Radio Club of America.—A paper on "Inductances and Oscillation Transformers" was presented before a meeting of the Radio Club of America at Columbia University, New York City, on April 14 by Melville Eastham.

New York Jovian League.—Dr. W. H. Tallman, director of the American Museum of Safety, addressed the members of the Jovian League of New York City on April 19 on "Industrial Safety." The league is planning a rejuvenation for May 12.

New York Electrical Society.—The 346th meeting of the society was held at the Engineering Societies Building on April 20. Simon Lake, the American creator of the modern level-keel type of submarine boat, delivered a lecture on "The Submarine in the War."

Brooklyn Polytechnic Branch A. I. E. E.—On April 20 Dr. Erich Hausmann spoke before the Polytechnic Institute of Brooklyn branch of the American Institute of Electrical Engineers, on the subject of "Polarized Light," and J. Van R. Wall, spoke on the topic "30,000-kw. Turbo-Generators."

Jovian Chapter, Cleveland Electrical League.—Percy Andreae, vice-president of the American Association of Foreign Language Newspapers, spoke at the regular meeting of the Jovian chapter of the Electrical League of Cleveland on April 20. His subject was "The Common Enemy."

Worcester Polytechnic Branch A. I. E. E.—The sixth regular meeting of the Worcester Polytechnic Institute Branch of the American Institute of Electrical Engineers was held on April 21, when F. M. Feiker, editor of the ELECTRICAL WORLD, delivered an address on the subject of "The Electrical Engineer and His Industry."

Detroit-Ann Arbor Section, A. I. E. E.—Frank Conrad, designing engineer of the Westinghouse Electric & Manufacturing Company of Pittsburgh, spoke before the members of the Detroit-Ann Arbor section of the American Institute of Electrical Engineers on April 14, his subject being "Electrical Equipment for Automobiles."

Metropolitan Jobbers' Association.—The annual meeting of the Metropolitan Jobbers' Association was held in New York City on April 10, 1916. Important plans were made for the coming year, and there was exhibited every evidence of even greater co-operation among the independent jobbers than during the successful year just closed. The following officers were unanimously chosen for the ensuing year: President, C. P. La Shelle, vice-president W. R. Ostrander & Company, New York; vice-president, L. D. Bailey, proprietor and general sales manager Bailey Electric Supply Company, New York; treasurer, Meyer Zucker, New York; secretary, Meyer Rutkin, Newark, N. J.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Brooklyn Company Section, N. E. L. A.—At the April meeting of the Brooklyn, N. Y., company section of the National Electric Light Association, held on April 18, Frank J. Sprague, member of the naval advisory board, spoke on his impressions of the United States Navy. The lecture was illustrated.

Los Angeles Jovian League.—At the regular meeting of the Jovian Electric League of Los Angeles, on April 12, Herbert J. Goudge explained colored photography and illustrated it on the screen by photographic slides, taken in their natural colors. He was followed by others with selections from their own collections of color slides.

Industrial Heating Bureau, N. E. L. A.—The industrial heating bureau of the commercial section of the National Electric Light Association met on April 11 in the office of the chairman of the bureau, C. F. Hirshfeld, at Detroit. The committee outlined the work for the coming year, and appointed six subcommittees to take up in detail the following subdivisions of the work of industrial heating: Electric furnaces for steel and ferroalloys; electric furnaces for non-ferrous metals, enameling and paint baking, electric welding, heat treatment and annealing of steel, industrial applications, such as soldering iron, glue pots, etc.

International Association of Municipal Electricians.—Details have been worked out and a tentative program made up, it is stated, for the twenty-first annual convention of the International Association of Municipal Electricians, to be held at Baltimore, Md., Aug. 22 to 25. The government will be represented by W. J. Canada of the Bureau of Standards. Dr. Charles P. Steinmetz will deliver an address during the convention. The committee in charge of the tentative program consists of Superintendent J. B. Yeakle of the Fire Alarm Telegraph of the City of Baltimore; George E. A. Fairley, assistant chief engineer to the Baltimore Electrical Subway Commission, and Douglas Burnett, commercial manager of the Consolidated Gas, Electric Light & Power Company of Baltimore.

Schenectady Section A. I. E. E.—W. B. Potter, chief engineer of the railway and traction engineering department of the General Electric Company, presented a paper entitled "Railway Electrifications" before the 173rd meeting of the Schenectady Section of the American Institute of Electrical Engineers on April 18. In addition to lantern slides, the paper was illustrated by motion pictures of the operation of the recently electrified Chicago, Milwaukee & St. Paul Railway. Maj.-Gen. Leonard Wood spoke on the subject of "Preparedness" on April 19, before a joint meeting of the section, the Schenectady Board of Trade and the Second Regiment of Infantry, stationed in Schenectady. Maj.-Gen. John F. O'Ryan, Commanding Division N. G. N. Y., and Brig.-Gen. Louis W. Stotesbury, Adjutant General, State of New York, also spoke. An illustrated lecture on "Photomicrography" was given by John B. Taylor, consulting engineer, on April 10 before a joint meeting of the Camera Club and the section.

Chicago Electric Vehicle Section, N. E. L. A.—The Chicago electric vehicle section of the National Electric Light Association has under consideration the standardization of lamps for use in electric vehicles, with a view to accomplishing the very significant saving which would result to manufacturer, dealer and user. The committee on standards which has the matter in hand has about reached the conclusion that a 40-44-volt, 15-watt, G-12 lamp with a bulb 1.5 in. in diameter will be best adapted to all the various uses of the electric vehicle. W. F. Bauer, chairman of the committee, stated that the lamp manufacturers were apparently willing to co-operate and that he thought the garage men and other dealers would be also. It is not known, however, whether or not the vehicle manufacturers will be in accord with the standardization movement, since they are not much affected by it, because each has his own standard. The size of lamps for instruments has not been considered thoroughly as yet, but the discussions seem to indicate that a 2-cp. or a 4-cp. lamp would best serve all requirements.

Northwest Electric Light & Power Association.—The ninth annual convention of the Northwest Electric Light & Power Association will be held in Seattle, Wash., on Sept. 6, 7, 8 and 9. The program has been arranged as follows: Sept. 6—Morning session, address of welcome, president's address, financial report, committee reports and announcements. Afternoon session, "Application of Overhead Line Construction Rules of the Public Service Commissions of the Northwest," editor, M. T. Crawford, Puget Sound Traction, Light & Power Company and "Effect of Obsolescence of Equipment on Cost of Service," editor, E. A. West, Portland Railway, Light & Power Company. Sept. 7—Morning session, "The Employer as an Educator of the Public," editor, Arthur Gunn, president, Wenatchee Valley Gas & Electric Company; "Merchandising and Operating in Small Towns and Rural Communities," editor (not yet named) of the Pacific Power & Light Company. Afternoon session, range committee report, W. R. Putnam, chairman. Sept. 8, morning session, round table conference, conducted by E. G. Robinson, president Northwest Electric Light & Power Association; afternoon session, "Co-operation Between Central Station, Manufacturer, Jobber, the Dealer and Contractor," editor, W. L. Goodwin, vice-president and sales manager, Pacific States Electric Company.

FINANCE, COMMERCE AND INDUSTRY

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

Unprecedented Business for 1916

Estimates Based on First Quarter Bookings of Three Largest Electrical Distributing Companies Show Business for Current Year to Be Almost Double That for 1915

In sharp contrast with the conditions obtaining a year ago the business in electrical manufactures during the first quarter of 1916 reached unprecedented levels. From the beginning of the year to the end of March the three largest distributors of electrical goods in the United States (the General Electric Company, Westinghouse Electric & Manufacturing Company and the Western Electric Company) booked orders totaling well over $80,000,000, or at the rate of about $325,000,000 a year. While it is recognized that the figures for a quarter's business are no strict criterion of what the business will be for the year, still it offers an interesting means of comparison with the aggregate business of these companies for previous years.

For the fiscal year 1913, the largest previous year on record (Westinghouse company's year ended March 31, 1914) the aggregate sales billed by these companies amounted to $228,000,000, or approximately $100,000,000 less than the estimate for 1916 based on the business for the first quarter. The 1914 sales billed amounted to $190,000,000 and the 1915 sales to $200,000,000.

The 1915 business of the General Electric Company was in the neighborhood of $85,000,000, of the Westinghouse Electric & Manufacturing Company somewhat in excess of $50,000,000 and of the Western Electric Company over $63,000,000.

For the first quarter of 1916 orders for electrical goods were booked by these companies as follows: General Electric, $38,000,000; Westinghouse, $25,000,000, and Western Electric, $20,000,000. If the business for 1916 should continue at the same rate throughout the year as for the first quarter it would almost mean a doubling of the 1915 business of both the General Electric and the Westinghouse companies, and an increase of about 30 per cent in the business of the Western Electric Company. The figures of both the Westinghouse Company and the General Electric are for electrical business only, being exclusive of munition orders.

Should bookings keep up at the rate they are now being made it will not be long before all of the manufacturing facilities of the companies will be signed up for 1916. Already these companies have all they can handle beyond the first of next year in some departments. The turbine department of the General Electric Company is jammed tight and the sales in its railway department for the first eight weeks of the current year compared with those of last year have been proportionately greater than those in any other department of the company. The lamp factories are crowded and orders are coming in faster than deliveries can be made. With but few exceptions all of the company's departments are booked up to capacity.

Western Electric is receiving an unusually large business from the Bell Telephone companies, and its business with other customers has been greater each month of this year than in the corresponding months in previous years. Gerard Swope, vice-president and general sales manager of the company, says in this regard in the company's monthly publication, the *Western Electric News:*

"Nineteen-sixteen has begun with great activity in all departments of our business. Those at Hawthorne know of the great activity in the manufacturing department, and those at each of the distributing houses know of the activity at their house, for the increased business has affected every part of the country.

"Our business with the Bell companies, which involves so much pressure on the manufactu.ing department, is running to unusual totals, and in the business with customers outside of the Bell system, each month of this year has been the largest month of that name in the history of the company.

"Coupled with this great expansion of business have come peculiar difficulties in the way of getting supplies, so that, as was stated in the report of one of our houses for 1915, the value of service as a business getter was never more evident. 'Much of the large business could not have been held without a high grade of service. The demands of the customer were so urgent that he was compelled to buy service as well as merchandise, and it is particularly gratifying that we still enjoy the business of those customers who have made the most extraordinary demands upon us. In referring to service we include prompt and accurate performance of all the steps involved in any transaction, from the time an inquiry is received until the customer has paid the bill.'

"This year it will be peculiarly a question of giving service to our customers, and if we do so we will be amply repaid, not only in the volume of business that we secure, but in the compensation that our customers are willing to pay for this service."

The Western Electric Company's general merchandise department reports that during the week ended March 13, 1916, orders were received for lead-covered cable in excess of any previous week in the history of the company. The orders call for cable totaling 453,000,000 ft. of conductor.

The Westinghouse company also is experiencing big business in practically all departments, the business being fairly well distributed with a normal ratio of business to the different departments. Since the first of the year, however, there has been a more than marked growth in the orders for very large equipment. Two examples are the $1,000,000 contract with the Inland Steel Company, which included a 15,000-hp. motor and two 8000-hp. motors and a contract for two 70,000-kw. steam turbine units for the Interborough Rapid Transit Company of New York City, which will be the largest steam turbines in the world.

Export Trade Situation

The exports of goods manufactured in the United States are much greater than those in previous years. Compilation made by the foreign trade department of the National City Bank of New York of the exports from the port of New York reported during the week ended April 8, 1916, show a total of $47,973,323, as compared with $26,400,015 and $18,594,934 during the corresponding weeks of 1915 and 1914, respectively.

The principal increase was in the export of brass manufactures. For the week ended April 8, 1916, the exports in this class amounted to $10,585,150, compared with $18,135 in the corresponding week of 1914.

The other items in which the exports showed large increases for the week ended April 8, and the approximate amounts when compared with this week in 1914, are as follows: Explosives, increase $8,800,000; metal working machinery, increase $1,200,000, and iron and steel manufactures, increase $1,600,000.

During the week ended April 8 there was exported $95,057 of copper wire, compared with $1,739 for the corresponding week in 1914, and $289,436 of electrical machinery, compared with $169,374 for the corresponding week in 1914.

Of the total exports the compilation shows that there went to France $10,770,475 during the week ended April 8, 1916, $6,783,583 during the week ended April 10, 1915, and $1,108,705 during the week ended April 11, 1914. There was billed for England during the same weeks respectively $24,352,637, $5,530,288 and $4,655,233. For the same weeks,

respectively, the exports to South America were $3,385,079, $1,884,912, $2,355,737.

About 85 per cent of the U. S. exports to South America go from the Port of New York. Compilation made by the National City Bank of New York for the month of March, 1916, show exports of electrical materials to South America from the Port of New York as follows: Argentina, $49,848; Brazil, $55,927; Colombia, $3,317; Chile, $7,962; Peru, $5,694; Uruguay, $2,702; Venezuela, $11,343, and all others, $2,077, a total of $138,870. The exports of electrical machinery to South America from the Port of New York during the month of March, 1916, were as follows: Argentina, $32,617; Brazil, $23,861; Colombia, $7,292; Chile, $16,169; Peru, $7,976; Uruguay, $4,316; Venezuela, $36,580; all others, $19,159; a total of $147,970. The total of both classes of exports amounted to $286,840.

Estimated Production of Copper for 1916 Over 2,000,000,000 Lb.

The Boston News Bureau has just made some interesting comments regarding the production of copper at the present time and has compiled some figures of the probable output for the current year which give striking results. For instance, if the present rate of production is maintained, the bureau finds that our refinery production for the twelve months of 1916 will for the first time exceed 2,000,000,000 lb. The estimated figure for the year is 2,096,875,000 lb., an increase of 449,875,000 lb. over 1915, or 27 per cent. It is important to note, however, that five producers will be responsible for 78 per cent of this increase. Never before in the history of the industry has the increase in any one year exceeded 150,000,000 lb.

In regard to the prices of the metal the bureau makes the following statement: "In the face of an unprecedented outpouring of the metal, sales of hundreds of millions of pounds are being made to eager buyers for delivery up to the end of the year at 27½ cents. This is the figure understood to be the price to be paid for the 300,000,000-lb. order just closed with the British Government.

"On top of all this we have heard of sales of electrolytic for May and June at better than 29 cents. Not in any year since 1873 has copper sold above 26¼ cents.

"The copper producers would seem to be assured of a gross business this year of at least $524,000,000, and this assumes an average price of only 25 cents per lb. If an average of 27 cents is received, the producers stand to sell their product for $565,920,000. Such is the boom conferred by the European war. The full import of these figures is appreciated when placed beside gross value of $288,220,000 for the 1915 production and $205,066,000 for 1914."

Manufacturing and Industrial

The S K F Ball Bearing Company has changed its headquarters from 50 Church Street, New York, to Hartford, Conn., where it has established an extensive manufacturing plant, as already noted in these columns.

E. W. Baird of the Baird-Osterhout Company, 1112 Chestnut Street, Philadelphia, Pa., has recently purchased the business of T. J. Cope of 3244 North Fifteenth Street, Philadelphia, manufacturer of underground electrical tools and equipment.

The Terry Steam Turbine Company, Hartford, Conn., has appointed C. A. Call manager of publicity. Mr. Call was employed by the General Electric Company for nearly seven years, two years of which were spent in the testing department and five years in the advertising department.

The Bright Star Battery Company, New York, will move into larger quarters May 1 at 316 Hudson Street. The company's business is in a flourishing condition, and has been increasing steadily for the past two years, so much so that it has been necessary for the company to increase its plant and its manufacturing facilities twice during that period.

The E. S. Cullen Machinery Company, Leader-News Building, Cleveland, Ohio, has recently been formed and is engaged in the manufacture of machine tools and locomotive cranes. E. S. Cullen, who has formed the company, was formerly connected with the Niles-Bement Pond Company for a number of years.

The Electric Fuseguard Company, Newark, N. J., has recently increased its capital stock from $25,000 to $50,000. The company has also established a new factory at 60 Shipman Street, Newark. W. G. Ligon is president of the company, G. W. Butts, vice-president; Charles R. Peddle, secretary, and A. J. Saunders, sales manager.

The S. L. Avis Company, Jamestown, N. D., contracting electrical engineer, has recently been engaged for the engineering work to be done on an electric-lighting system which is to be installed in Wishek, N. D. The company announces that it would like to receive trade literature covering steam, electric and crude-oil equipment, ranging in rating from 25 hp. to 75 hp.

Central Station Power Sales Multiplied by Three at Chicago.—Since Jan. 1, 1916, the power sales department of the Commonwealth Edison Company has signed contracts for three times as much electrical energy as was contracted for in the same period last year. Among the large companies which have recently signed power contracts is the Western Electric Company with 3000 hp., the Stewart Speedometer Company 1200 hp. and the Hotel Morrison.

Pyroplax.—The material known as "Pyroplax" which the Globe Stove & Range Company of Kokomo, Ind., has recently adopted, to replace porcelain in the heating units for its ranges, is a composition made from silica and limestone with a binder of asbestos. It is made by finely grinding the several ingredients, after which they are thoroughly mixed and then molded. It is a non-conductor of electricity, is tough, durable and will stand continued and successive applications of heat.

Lamp Imports.—There were imported into the United States during the quarter July 1 to Sept. 30, 1915, electric lamps to the aggregate amount of $226,068 on which $67,776.20 in duty was collected. The largest imports were of metal filament lamps, of which 1,056,621 lamps, valued at $211,855, were brought in. Carbon filament lamps were next, with a total of 41,759 lamps, valued at $2,649. Arc lamps numbered twenty-two and were valued at $442. The remaining $11,122 represented all other lamps.

The Bleadon-Dunn Company, 208 North Fifth Avenue, Chicago, Ill., manufacturer of violet-ray instruments, has established an agency at 1182 Broadway, New York, which will be in charge of the Violetta Company, which has been recently formed and which will be under the management of A. I. Werner. All the Eastern business of the company will be taken care of through this office. The company reports that orders in considerable numbers are being received both from different parts of this country and from foreign countries.

The Moloney Electric Company.—L. H. Keller, who for the last three years has been manager of the Chicago district office of the Moloney Electric Company, has been transferred to the company's home office at St. Louis, where he is being advanced to an executive position. Mr. Keller has been with the Moloney Electric Company ever since he was graduated from the University of Missouri in 1912. Ralph B. Coleman, who has been traveling out of the Chicago office, will succeed Mr. Keller as manager. Mr. Coleman was formerly connected with the Electric Machinery Company at Minneapolis.

The Roller-Smith Company, 203 Broadway, New York City, announces that it has added to its list of agents the Barber-James-Dwinnell Electric & Manufacturing Company, 600 East Fifteenth Street, Kansas City, Mo. This new agent will handle the Roller-Smith Company's instruments, meters and circuit breakers in the territory comprising the States of Kansas, Oklahoma, Nebraska, Iowa and part of the State of Missouri. The Roller-Smith Company now has branch offices in the Monadnock Block, Chicago, and the Williamson Building, Cleveland. Its complete list of agents, other than the new one referred to above, is as follows: The Conant Electric Company, Equitable Building, Baltimore; W. W. Geisse, First National Soo Line Building, Minneapolis, Minn.; H. D. Lackore, 544 Henry Building, Seattle; H. I. Shire, 1310 Majestic Building, Detroit, and the Tompkins-Stoddard Company, 77 Franklin Street, Boston.

American Electrical Appliances Exploited at Tasmania Demonstration.—According to Consul W. A. Bickers, stationed at Hobart, Tasmania, a number of American products were on display and were demonstrated at an exhibit recently by the Tasmanian Hydroelectric Department. The goods on display were mostly of American and British manufacture, and it is safe to state, the consul declares, that there were as many of American make as British. In cooking appliances American wares predominated, while British makes had the advantage in heating and lighting appliances. The General Electric and Hotpoint products formed the bulk of the American display, though a few articles of other makes were also to be found. Consul Bickers states that Tasmania at the present time offers an exceptional market for various types of electric appliances for installation in homes and small factories.

Electric Paring Machines for Preparing Army Foods.—The American Machinery Company, 1225 Callowhill Street, Philadelphia, Pa., manufacturer of several types of electrically operated vegetable-paring machines, reports that the Graham Company, Ltd., of Belleville, Ont., has recently bought a number of its machines which will be used in paring vegetables which are to be canned for use by the allied armies in Europe. This firm is putting up a dessicated compote of six vegetables, which are first pared by the electric machines, then dried and then granulated; finally the six kinds of vegetables are mixed and packed in cans. A contract for several million cans has been received by the above-named company for use by the allied armies. The paring machines are also being favorably received for use on United States warships, an order for quite a number of them having been received from the United States government during the past four or five months. The American Machinery Company has also prepared a very long list of users of its machines, which includes various hotels, clubs, restaurants, cafés, hospitals, schools, seminaries, public institutions, food manufacturers, steamship companies, etc., in different parts of the United States and foreign countries.

Orders for Boiler-Feed Regulators.—The Erie Pump & Equipment Company, Erie, Pa., reports that it has recently received the following noteworthy orders for its "Copes" boiler-feed regulators: The Detroit Edison Company, the Youngstown Sheet & Tube Company, the Edison Electric Illuminating Company of Boston, the Brooklyn Rapid Transit Company and the Long Island Electric Railway Company. The Erie Pump & Equipment Company has recently been formed and represents a consolidation of the Northern Equipment Company, which for the past eight years has been sole owner of the patents and sole manufacturer and distributor of the "Copes" boiler-feed water regulators and the "Copes" pump governors, and the Erie Pump & Engine Works, which for a number of years have been manufacturing pumping outfits, engines and various accessories. The officers of the Erie Pump & Equipment Company are: E. W. Nick, president and treasurer; V. V. Veenschoten, vice-president, and R. W. Andrews, secretary. Mr. Nick has entire charge of the sales work on the centrifugal pumps and engines as well as the general management of the company. Mr. Andrews has charge of the sales work on the boiler-feed water regulators and pump governors and other steam specialties. Mr. Veenschoten has charge of the manufacturing end of the business. The "Copes" boiler-feed regulator has recently been improved.

The H. M. Hirschberg Company Wins in Its Appeal Regarding Duty on Carbons.—As already noted in the ELECTRICAL WORLD of April 1, page 751, a decision has recently been made by Presiding Judge Montgomery of the United States Court of Customs Appeals reversing a decision made by the Board of General Appraisers regarding the duty declared on certain types of arc-lamp carbons. As contended by the H. M. Hirschberg Company, 39 East Twentieth Street, New York, importer of arc-lamp carbons, in a test case, the old type flaming-arc carbons consist chiefly of retort carbon, or lamp black, with an impregnated core, and for that reason should be classed as "carbons for electric lighting composed chiefly of lampblack or retort carbon," for which an assessment of 40 cents per 100 ft. is made, instead of as "carbons for flaming-arc lamps" (new clause of tariff law), for which a duty of 30 per cent is charged. Collector Malone took the view that the old type flaming-arc carbons came under the latter classification. In its decision the Board of General Appraisers held that the testimony given by the H. M. Hirschberg Company was not sufficient to show which provision of Paragraph 82 of the tariff law should govern the classification, and therefore upheld the collector's decision. The Presiding Judge of the court, however, said that the board "failed to accept at its value the testimony which was adduced on behalf of the importers." According to the latest decision the duty charged for the old type carbons with impregnated cores will be 40 cents per 100 ft. and the importing companies will be refunded money paid in excess of this rate as per the original decision made by the collector.

NEW YORK METAL MARKET PRICES

	April 11 — Selling Prices Bid	Asked	April 18 — Selling Prices Bid	Asked
Copper	£ s d		£ s d	
London, standard spot	120 0 0		128 0 0	
Prime Lake	28.25	to 28.75†	29.00	to 29.50†
Electrolytic	28.25	to 28.75†	29.50	to 30.00†
Casting	26.75	to 27.25†	27.25	to 27.75†
Copper wire base	30.00	to 31.00†	31.50	to 32.00†
Lead	7.50		7.50	
Nickel	45.00	to 50.00	45.00	to 50.00
Sheet zinc, f.o.b. smelter	.....		25.00†	
Spelter	18.92½	to 19.17½†	19.05	to 19.30†
Tin, straits	54.50†		51.50†	
Aluminum, 98 to 99 per cent.	57.00	to 59.00†	57.00	to 59.00

OLD METALS

Heavy copper and wire	22.00	to 22.50†	23.00	to 23.50†
Brass, heavy	14.00	to 14.50†	14.50	to 15.00†
Brass, light	11.25	to 11.75†	11.75	to 12.00†
Lead, heavy	6.65	to 6.87½†	6.40	to 6.62½†
Zinc, new scrap	15.50	to 16.00†	16.50	to 17.25†

COPPER EXPORTS

Total tons to April 18	14,273

†Nominal.

Corporate and Financial

Buckeye Light & Power Company, Covington, Ohio.—Authority has been granted the company by the Ohio Public Utilities Commission to issue $6,500 of common stock, at not less than par. The proceeds will be applied to an indebtedness of $7,776.83, incurred in construction and improvement work in 1913, 1914 and 1915.

Carolina Power & Light Company, Raleigh, N. C.—A block of first mortgage 5 per cent gold bonds due Aug. 1, 1938, is being offered at 95.5 and interest.

Central New York, Gas & Electric Company, Geneva, N. Y.—A block of first mortgage 5 per cent gold sinking fund bonds, due July 1, 1941, is being offered at 99 and interest.

Chattanooga (Tenn.) Railway & Light Company.—The company's annual report for 1915 states that the industrial depression was seriously felt in Chattanooga. While the street railways did not suffer from jitney competition their patronage was reduced by a smallpox epidemic during the first three months of the year. In September, however, business began to show improvement, bringing substantial increases in all classes of earnings during the last few months of the year. The following statement shows the results of the operation of the company for 1915 as compared with 1914:

	1915	1914
Gross earnings	$1,087,343	$1,085,096
Operating expenses	646,668	616,966
Net earnings	$440,675	$468,130
Taxes	81,063	82,758
Net earnings after taxes	$359,612	$385,372
Interest	357,762	339,408
Surplus	$1,850	$45,964

Cincinnati (Ohio) Gas & Electric Company.—An issue of $4,500,000 of first and refunding mortgage 5 per cent forty-year sinking fund gold bonds due April 1, 1956, is being offered at 99.5 and interest. The sale of the issue is for the purpose of providing funds for improvements and for the construction of an electric generating station with an initial capacity of 50,000 kw. and an ultimate capacity of 100,000 kw.

Commonwealth Power, Railway & Light Company, Jackson, Mich.—In a statement to the stockholders on Feb. 1 it was stated that the taxes paid by the company and its subsidiary companies during 1915 were $823,776, as compared with $788,008 in 1914, an increase of 4.54 per cent, which, however, would have been materially greater were it not for the fact that during the year several subsidiary companies were combined, greatly simplifying the corporate relations between the company and its operating subsidiaries, reducing the number of such subsidiary companies by eighteen, and eliminating duplicate payments under the federal law upon income passing from one company to another, thereby effecting a material saving in such taxes. In addition to the completion of railways during 1915, the principal construction work has been the building of the fourth hydroelectric plant on the Au Sable River at Mio and service installations. The Mio plant will have an installed capacity of 6000 hp. and is expected to be completed and delivering energy to the transmission system in the fall of 1916. During 1915 over 20,000 hp. additional power business was added to the company's lines. Of the total preferred and common stock of the company, $9,435,600, or 27.75 per cent of the total outstanding, is held in the States in which the company's properties are situated. The combined result of the operations for 1915 is shown in the following statement, which eliminates all sales of electric energy to subsidiary distribution and railway companies and other inter-company transactions:

Gross receipts:	1915	1914
Gas	$2,670,456	$2,604,889
Electric, heating and water	5,650,816	5,130,897
Railway	6,268,851	6,270,698
Total	$14,590,123	$14,006,484
Operating expenses	6,964,679	6,761,891
Gross income	$7,625,444	$7,244,593
Fixed charges, including taxes and dividends on outstanding preferred stocks of subsidiary companies	5,329,857	5,000,859
Net income available for dividends, replacements and depreciation	$2,295,587	$2,243,734
Dividends on preferred stock	960,000	960,000
Balance	$1,335,587	$1,283,734

Denver (Col.) Gas & Electric Light Company.—A block of $500,000 of first and refunding 5 per cent sinking fund bonds, due on May 1, 1951, is being offered at 93 and interest.

Harwood Electric Company, Hazleton, Pa.—At the close of the fiscal year, according to the annual report for 1915, the number of customers of the company was 6343, an increase of 826, as compared with the number at the close of the previous year. The demand on the company's plant at the end of the year was approximately 9900 kw., which was an increase of 1900 kw. During 1915 the output was 40,081,700 kw.-hr., an increase of 11,164,375 kw.-hr. The results of the business of the company for the year ended Dec. 31, 1915, were as follows:

Operating revenue		$498,929
Operating expenses	$272,632	
Depreciation	62,800	
		335,432
Net operating revenue		$163,497
Non-operating income:		
Revenue:		
Investments	$70,400	
All other sources	29,836	
		100,236
Gross income		$263,733
Interest on funded debt	$178,070	
Interest on other liabilities	30,605	
Amortization of bond discount	10,910	
		219,585
Net income for fiscal year carried to profit and loss		$44,148

Kentucky Public Service Company, Bowling Green, Ky.—A new issue of $1,080,000 of first mortgage 5 per cent gold bonds, dated Feb. 1, 1916, due Feb. 1, 1941, of which $2,000,000 have been authorized, is being offered to investors at 96 and interest. Improvements to the company's properties, besides those for gas operation, include a new electric plant in Hopkinsville, Ky., with a total capacity of 1500 kw., a high-power electric transmission line from this plant to the company's plant in Clarksville, Tenn., approximately 30 miles distant, and two new 625-kw. steam turbines, with condensing apparatus, now being installed in the electric plant in Bowling Green.

Marconi Wireless Telegraph Company of America, New York, N. Y.—There are at present nearly 500 ships equipped with Marconi apparatus which is leased in each case for a term of years, according to the company's annual report for 1915. No change has occurred in the commercial status of the transatlantic stations, the high-power equipment remaining closed to business on account of the war. The British Admiralty still holds for Government use the English plants constructed to operate with the company's Belmar and New Brunswick duplex stations, and thus far, because of the war, it has been impossible to open similar direct service with Norway and northern Europe through the newly completed high-power stations at Marion and Chatham, Mass. Engineers of the company have been giving special attention to the design of suitable wireless equipment for aeroplanes and, the report states, are confident that highly efficient apparatus for communication from aircraft will soon be developed. A comparative summary of operations for 1914 and 1915 follows:

	1914	1915
Gross earnings from operations	$756,572	$748,238
Less royalties	3,428	43,701
	$753,144	$704,537
Deduct:		
General operating and administration expenses (less royalties)	631,530	520,475
Net earnings from operations	$121,614	$184,062
Add:		
Income from investment of surplus funds	150,274	104,933
	$271,888	$288,995
Deduct:		
Reserves:		
For depreciation of coast stations	30,038	22,645
For depreciation of ship stations	29,473	31,538
Against expiration of patents	50,000	50,000
Miscellaneous	12,500	7,500
	$122,011	$111,678
Net income for year after charging reserves, carried to balance sheet	$149,877	$177,317

Nashville (Tenn.) Railway & Light Company.—Under ordinary conditions, it is stated in the annual report of the company for 1915, light and power earnings grow steadily from year to year, but notwithstanding active soliciting and house-wiring campaigns, the year 1915 showed practically no increase in that class of business. The street railway earnings were about $100,000 less than in 1914, and probably three-fourths of this decrease, it was stated, was due to jitney competition, the enforcement of the measures passed by the authorities for the control and regulation of the jitneys having been delayed by litigation until the end of the year. The following statement shows the results of the operation of the company for 1915 as compared with 1914:

	1915	1914
Gross earnings	$2,143,902	$2,240,307
Operating expenses	1,121,716	1,159,523
Net earnings	$1,022,186	$1,080,784
Taxes	197,117	194,209
Net earnings after taxes	$825,069	$886,575
Interest	510,588	499,670
Surplus	$344,481	$386,905

Northern States Power Company, Chicago, Ill.—A block of $2,000,000 of 7 per cent cumulative preferred stock is being offered at 97.5 and dividends.

Union Railway, Gas & Electric Company, New York, N. Y.—An issue of $3,000,000 of three-year 5 per cent gold notes, due on April 1, 1919, is being offered at 98.5 to yield 5.55 per cent.

United Light & Railways Company, Grand Rapids, Mich.—The business of the company in the gas and electric departments for 1915, it is stated in the annual report, showed a satisfactory increase, but, due to partially depressed industrial conditions and the so-called jitney competition during the spring and summer months of 1915, the railway department receipts showed a decrease. The electric department's commercial output amounted to 93,276,013 kw.-hr., an increase of 2,416,430 kw.-hr. Of the 1915 gross earnings 36.82 per cent or $2,322,984 was derived from electric sales as compared with $2,079,145 or 33.71 per cent of the total in 1914. Of the 1915 net earnings 44.4 per cent or $1,101,702 was derived from electric earnings in comparison with $1,004,568 or 42.4 per cent of the 1914 net earnings. The report states that business conditions in all of the

communities served by the company at present are very satisfactory and that all departments showed material increases in gross and net earnings for the first quarter of the current year. The statement of earnings and expenses of the company and its subsidiary companies for 1915 is as follows:

SUBSIDIARY COMPANIES		
*Gross earnings		$6,308,776
*Operating expenses, including maintenance and taxes		3,827,262
Net earnings		$2,481,514
Interest and dividends:		
To United Light & Railways Company	$411,785	
To the public	975,371	1,387,156
Net earnings on stocks		$1,094,358
Net earnings due others than United Light & Railways Company		14,793
UNITED LIGHT & RAILWAYS COMPANY		
Earnings available on stocks owned by United Light & Railways Company		$1,079,565
Dividends and interest receivable		424,116
Miscellaneous earnings		122,511
Gross earnings		$1,626,192
Expenses	$117,460	
Taxes, general and federal	9,856	127,316
Net earnings		$1,498,876
Interest on first and refunding 5 per cent bonds	$360,494	
Interest on three and five-year bond secured notes	92,758	453,252
		$1,045,624
Interest on general notes	$61,868	
Bond discount	5,015	66,883
Balance available for dividends		$978,741
Dividends—First preferred stock, 6 per cent		525,789
		$452,952
Dividends—second preferred stock, 3 per cent		31,631
Surplus earnings		$421,321

*Note: The amount of $804,466.30 included in the gross earnings and operating expenses of subsidiary companies represents inter-company transactions, of which $276,117.77 is for electric power sold to subsidiary railway companies.

New Utility and Industrial Companies

The Milroy Light & Power Company of Milroy, Ind., has been incorporated by William M. Barton, William B. Crane, Frank McCorkle and Calude Crane. The company is capitalized at $6,000 and proposes to supply light, heat and power in the town of Milroy.

The Southern States Electric Company of Birmingham, Ala., has been granted a charter with a capital stock of $12,000. The officers of the company are: W. E. Mitchell, president; V. H. Hansman, vice-president, and F. W. Hansman, secretary and treasurer.

The Maquoketa River Power Development Company of Maquoketa, Iowa, has been incorporated with a capital stock of $50,000 for the purpose of constructing a dam across the Maquoketa River. Robert M. Rogers of Cedar Rapids is president of the company.

The Furnace Specialties Company of New York, N. Y., has been incorporated by L. N. and G. Vanse and E. Powers, 15 Broad Street, New York, N. Y. The company is capitalized at $100,000 and proposes to manufacture and deal in furnaces, oil gas, electrical appliances, ceramics, etc.

The Bartlett-Yates Insulation Company has filed articles of incorporation with a capital stock of $10,000 for the purpose of doing a general electrical and mechanical engineering business; electricians, etc. The incorporators are: J. S. Yates, B. L. and H. N. Bartlett, 312 Park Street, Westfield, N. J.

The Differential Car Company of New York, N. Y., has been incorporated with a capital stock of $25,000 to manufacture electric dump cars, machinery and tools; also to do a general contracting and engineering business. The incorporators are: S. B. Howard, J. F. Curtin and S. A. Anderson, 36 Nassau Street, New York, N. Y.

The West Penn Power Company of Pittsburgh, Pa., has been chartered with a capital stock of $20,000,000 by Samuel Insull, Guy E. Tripp, James D. Mortimer, H. H. Pierce and H. H. Porter. The company will take over and operate important electric light and power properties of the West Penn Traction Company in the vicinity of Pittsburgh.

Trade Publications

Copper-Clad Wire.—The Standard Underground Cable Company, Pittsburgh, Pa., has issued Bulletin No. 202-1 on its "Colonial" copper-clad wire.

Electric Irons.—The Bigelow Company, Chicago, Ill., has prepared several illustrated folders containing information on its various types of electric irons.

Electric Pumps.—The Goulds Manufacturing Company, Seneca Falls, N. Y., has issued a circular on its "Pyramid" brass-lined, double-acting electric piston pump.

Magnetos.—The Bosch Magneto Company, New York, has prepared a circular which lists various cars in winning races which have been equipped with Bosch magnetos.

Boring Machine.—The Bowlus Manufacturing Company, Springfield, Ohio, has issued an illustrated folder which contains information on its chain-drive boring machine.

Battery Charger.—The Ohio Electric Works, Cleveland, Ohio, are sending out a folder which contains information on a magnetic rectifier, electric projector and small lighting plants.

Arc-Lamp Controller.—"Automatic Precision Feed for Projection Arc Lamps" is the title of an illustrated folder published by the Speed Controller Company, 257 William Street, New York.

Electric Incubators.—The Lo-Glo Electric Incubator Company, 76 Greenwich Street, New York, has prepared a catalog descriptive and illustrative of its electric incubators, hovers and egg testers.

Electric Pumps.—The Fort Wayne (Ind.) Engineering & Manufacturing Company has recently issued Bulletin No. 4082, descriptive of its electrically operated shallow-well pumps and house pumps.

Conduit Fittings.—Charles D. Robin, 48 Warren Street, New York, is sending out an illustrated leaflet on the "C. G. R. pipelets," a new type of fitting for use at the ends of exposed iron conduit or BX cable.

Small Hydroelectric Generator.—A small toy generator which is operated by a water motor attached to an ordinary hydrant is described in a leaflet issued by the W. N. Manufacturing Company, Manchester, Conn.

Dish Washers.—The Walker Brothers Company, Syracurse, N. Y., has prepared several illustrated bulletins which contain information on its electrically operated dish-washing machines.

Electric Sterilizers.—The Halverson Company, 111 Sixth Street, Portland, Ore., has prepared several illustrated circulars containing information on three types of electrically operated sterilizers for use by dentists and physicians.

Automobile Ignition and Lighting Appliances.—Catalog No. 41 prepared by the Connecticut Telephone & Electric Company, Meriden, Conn., contains information on the company's line of ignition and lighting devices for automobiles.

Electric Garage Pump.—The Kellogg Manufacturing Company, Rochester, N. Y., has recently issued a catalog descriptive of its products for use in garages, notable among which are several types of electrically operated air compressors and tire pumps.

Motor-Generator Set for Motion-Picture Projector.—J. H. Hallberg, New York, has prepared Bulletin No. 1 which describes and illustrates a Type P motor-generator set for converting alternating current into direct current for use with projector arc lamps.

The Holtzer-Cabot Electric Company.—An attractively prepared brochure has been prepared by the Holtzer-Cabot Electric Company, 115 Amory Street, Roxbury, Boston, Mass., containing a historical outline of the company's progress during the past forty years, and describing its new plant which has recently been completed.

Lighting Systems.—The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill., has issued four new portfolio plates. Plate No. 43 contains sketches and photographs of stage lighting systems without footlights, Plate No. 44 of artificial daylight systems for art museums, Plate No. 30 of indirect lighting systems for factories, and Plate No. 31 of church-lighting systems.

New England

TILTON, N. H.—The village of Tilton has awarded the Tilton Electric Light & Power Company a new contract for street-lighting. The contract is for a period of ten years and provides for the installation of 42 nitrogen filled lamps of 400 cp to replace the 26 arc lamps now in use.

BECKET, MASS.—Application has been made to the Selectmen by F. W. Munch of Canaan, N. Y., for a franchise to install an electric-lighting system in village of Becket and vicinity.

BOSTON, MASS.—Jacob W. Wilbur, 89 State Street, Boston, Mass., would like prices on equipment for an electric-light plant (alternating current) of sufficient output to furnish electricity for 25 houses, 25 street lamps and hotel.

CAMBRIDGE, MASS.—An ordinance has been adopted by the City Council providing for the appointment of a special committee to investigate the feasibility of establishing a municipal electric-light plant; also to consider the purchase of the plant of the Cambridge Electric Light Company or building a new plant.

MIDDLEBORO, MASS.—The Municipal Electric Light Board of Middleboro has applied to the State Board of Gas and Electric Light Commissioners for permission to supply electricity from the municipal electric plant in the town of Lakeville.

MILFORD, MASS.—The Selectmen have signed a contract with the Milford Electric Light & Power Company for lighting the streets of the town for a period of five years. The new contract provides for 588 nitrogen-filled lamps, 408 of 40 cp., 100 of 60 cp. and 80 of 100 cp. All gasoline lamps now in use will be replaced with electric lamps.

PLYMOUTH, MASS.—Preparations are being made by the Plymouth Electric Light Company for the erection of a three-phase, 22,000-volt transmission line to Middleboro, a distance of 12 miles. The company is in the market for material for the above line. E. P. Rowell is manager.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

Middle Atlantic

BINGHAMTON, N. Y.—The Public Service Commission has granted the Binghamton Light, Heat & Power Company permission to issue $798,000 in bonds and $280,300 in capital stock, of which the proceeds will be used to purchase a new 3500-kw. turbo-generator and appurtenances.

BROOKLYN, N. Y.—Bids will be received by L. H. Pounds, president of the borough of Brooklyn, Borough Hall, until April 26 for furnishing new lighting fixtures, appliances, additions and repairs to present equipment in six public bath houses, and complete new electric wiring, fixtures and appliances in three public comfort stations and sewer repair yard, Thirty-eighth Street, borough of Brooklyn. Blank forms and further information may be obtained and plans and drawings may be seen at the office of the president of borough of Brooklyn, 50 Court Street, Brooklyn.

BUFFALO, N. Y.—The City Council is contemplating the installation of 70 new magnetite arc lamps on Genesee Street from Washington to Jefferson Street.

EAST AURORA, N. Y.—Plans are being considered for the installation of a new system of street lighting in East Aurora.

ELLENVILLE, N. Y.—The Ellenville Electric Company is rebuilding its distributing system in Ellenville, including the erection of new poles, new wire and installing new transformers. C. C. Davis is superintendent.

FAIRPORT, N. Y.—A new return tubular boiler and water softening plant are being installed in the municipal electric-light plant. C. J. Sullivan is manager.

LEWISTON, N. Y.—The Sanborn-Pekin Electric Power Company of Sanborn has applied to the Public Service Commission for permission to erect a power plant in Lewiston and also for a franchise to distribute electricity over a half mile strip along the eastern portion of the township and also to supply energy for lighting streets and residences in Sanborn.

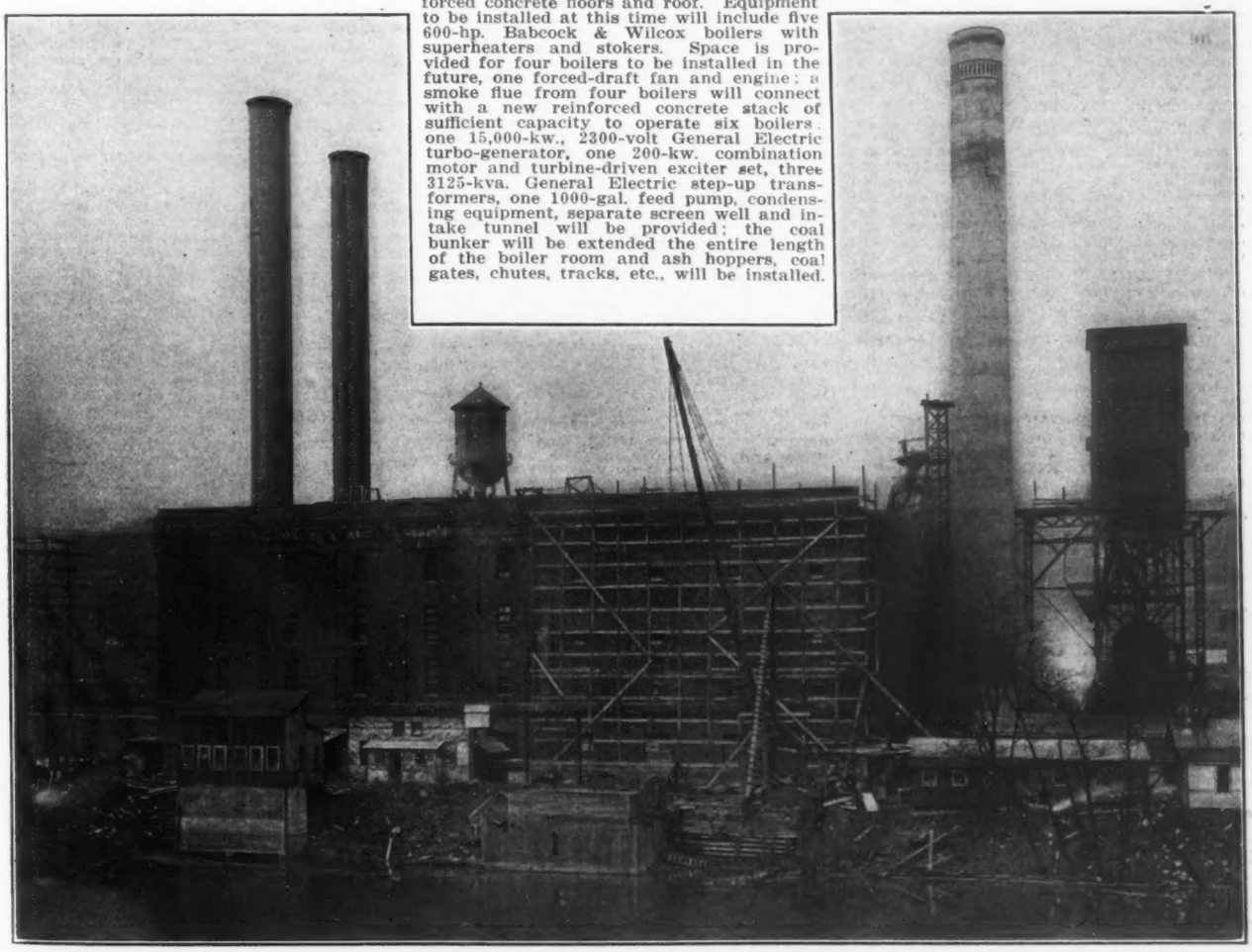
NEW YORK, N. Y.—Bids will be received by the Board of Trustees in the Staff Room of Bellevue Hospital, 415 East Twenty-sixth Street, New York, until May 1 for furnishing material and labor necessary for the erection of new balconies, including electrical work, on the south side of pavilions "I" and "K" of the new Bellevue Hospital. Blank forms and further information may be obtained at the office of the chief clerk and auditor, 400 East Twenty-ninth Street.

NEW YORK, N. Y.—Bids will be received by the Department of Public Charities, Tenth Floor, Municipal Building, New York, until April 26 for furnishing manhole and junction box frames and covers, building materials, vitrified tile duct, high-tension and low-tension wire and incidental material. Blank forms and further information may be obtained at office of the purchasing agent of the department.

PORT LEYDON, N. Y.—The Port Leydon Electric Light & Power Company is contemplating the installation of a 170-hp. Trump turbine to replace present water wheel. H. E. Wilson is proprietor.

The Power Station of the Republic Railway & Light Company at Lowellville, Ohio

Work has started on the extension of the power station of the Republic Railway & Light Company at Lowellville, Ohio. The plans provide for the addition of four bays to the boiler and turbine rooms, to be built of brick and structural steel, with reinforced concrete floors and roof. Equipment to be installed at this time will include five 600-hp. Babcock & Wilcox boilers with superheaters and stokers. Space is provided for four boilers to be installed in the future, one forced-draft fan and engine; a smoke flue from four boilers will connect with a new reinforced concrete stack of sufficient capacity to operate six boilers; one 15,000-kw., 2300-volt General Electric turbo-generator, one 200-kw. combination motor and turbine-driven exciter set, three 3125-kva. General Electric step-up transformers, one 1000-gal. feed pump, condensing equipment, separate screen well and intake tunnel will be provided; the coal bunker will be extended the entire length of the boiler room and ash hoppers, coal gates, chutes, tracks, etc., will be installed. The Stone & Webster Engineering Corporation of Boston, Mass., has the contract for the work.



MARCUS HOOK, PA.—The installation of a municipal electric-light plant is under consideration.

NEW CASTLE, PA.—The Mahoning & Shenango Railway & Light Company has awarded a contract to the Stone & Webster Engineering Corporation of Boston, Mass., for the construction of a substation in New Castle, to cost about $150,000.

POTTSVILLE, PA.—The Eastern Pennsylvania Light, Heat & Power Company of Pottsville is planning to extend its high-tension transmission lines to Auburn and Tremont. The company has recently purchased the electric plants at those places. The transmission line will be extended to Tremont through Mount Laffee, tapping the Frackville line, thence to Branchdale and Tremont and from there to Pinegrove, where contract has been secured for furnishing electricity. The Auburn line will be an extension from Orwigsburg and will also connect with Port Clinton and supply energy in that town.

BAYONNE, N. J.—The Public Service Electric Company has submitted a proposition to the City Commission for a five-year lighting contract, to include the installation of a new street-lighting system in Central Bayonne and underground conduit system, the initial cost of the latter to be $25,000.

BAYONNE, N. J.—The Central Broadway Business Men's Association has appointed a committee to obtain data for a private electric power plant to supply electricity for the proposed new street-lighting system to be erected along Broadway. N. J. Steinberg, K. D. Brown, Frank Davis and Charles Grotsky are members of the committee.

BALTIMORE, MD.—The annual report of Lighting Superintendent Mohr provides for the installation of 300 arc lamps, 300 incandescent lamps, 25 250-watt nitrogen-filled lamps and the changing of 500 lamps from the overhead to the underground service during the year 1916.

CENTREVILLE, MD.—Arrangements are being made for the installation of a 150-hp. Diesel oil burning engine directly connected to a Westinghouse three-phase, 2300-volt generator, a Tirrill voltage regulator and switchboard watt-hour meter in the municipal electric-light plant. L. D. Shank is manager.

FREDERICK, MD.—Bids will be received by the Mayor and the Board of Aldermen of the city of Frederick at the office of the city registrar until May 1 for the installation of an electric-lighting system as follows: (A) Extension of and repairs to existing building; (B) Installation of power plant equipment, boilers, generator and switchboard; (C) Revision and extension of linework, furnishing lamps, transformers, electrical equipment and power station wiring. Plans and specifications may be obtained at the office of Charles L. Reeder, Park Avenue and Saratoga Street, Baltimore, for which a deposit of $10 will be required for each set of plans, of which $7.50 will be refunded upon return if same.

WHEELING, W. VA.—Plans are being considered by the City Council for extensions and improvements to the city lighting system.

CHARLOTTESVILLE, VA.—The Charlottesville & Albemarle Railway Company, is reported to be in the market for a 50 to 75-kw., 60-cycle, 2300-volt motor-generator set.

MINERAL, VA.—An election will be held April 29 to submit to the voters the proposal to issue $10,000 in bonds for the installation of an electric-light plant and water-works system.

WASHINGTON, D. C.—Bids will be received at office of the Commissioner of Indian Affairs, Department of the Interior, Washington, D. C., until April 26 for furnishing and delivering at the Cheyenne River Agency an automobile ambulance. For further information address Cato Sells, commissioner.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, until May 20 for furnishing and installing an electric-distributing system at the Naval Hospital at Washington. Plans and specifications may be obtained on application to the above bureau.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Brooklyn, N. Y., Schedule 9545—5500 ft. telephone cable, 2000 ft. single-conductor wire; Schedule 9525—one electric welding apparatus; Schedule 9551—one universal milling machine; Schedule 9550—three compound-geared, electrically-operated deck winches; Schedule 9531—11,422 ft. galvanized steel tubing; Schedule 9532—25 governor valves for pumps; Schedule 9561—10 gage testing outfits. Portsmouth, N. H., Schedule 9545—6400 ft. galvanized steel conduit. Norfolk, Va., Schedule 9552—five ½-kw. radio motor generators, five starter panels, seven 2-kw. radio transformers; Schedule 9544—144 steel boiler tubes. Boston, Mass., Schedule 9545—8000 ft. rat-tail wire for aerials; Schedule 9549—two double-geared steam-driven deck winches; Schedule 9561—25,200 ft. galvanized steel conduit. Norfolk and Mare Island, Schedule 9553—1230 lb. seamless brass tubes, miscellaneous condenser tubes, miscellaneous copper and zinc turbine blading, 158 lb. hard drawn copper. Pearl Harbor, Hawaii, Schedule 9554—one cutting and welding apparatus. Mare Island, Cal., Schedule 9566—one 12-in. by 8-in. motor-driven moulder. Applications for proposals should designate the schedule desired by number.

North Central

BIRMINGHAM, MICH.—Bids will be received at the office of Clarence Vliet, superintendent of public schools, Birmingham, until May 6 for construction of high school building, including general contract work, electrical work (including electric wiring and clock system), plumbing and gas piping, and heating system. Copies of plans and specifications may be obtained at the office of Edward C. Van Leyen and Edward A. Schilling, architects, Union Trust Building, Detroit, upon deposit of $15.

DETROIT, MICH.—The Continental Motor Company, East Jefferson Avenue, Detroit, is planning to double the size of its plant, which will include an addition to power plant and the installation of much new electrically driven machinery.

DETROIT, MICH.—Considerable property in the northeast district of Detroit has been purchased by the Cadillac Motor Company, on which, it is reported, it will erect a new plant. A large amount of electrical equipment will be required and a new power plant will also be installed.

GREENVILLE, MICH.—Contracts will soon be awarded for the installation of an ornamental street-lighting system, for which bonds were recently authorized.

HOUGHTON, MICH.—Plans have been prepared by the Houghton County Electric Light Company for extensions and improvements to its system, including the installation of an electric generating unit and equipment. The plant is operated by the Stone & Webster Management Association, Boston, Mass.

JACKSON, MICH.—The City Council has authorized the purchase of poles and fixtures for the extension of the ornamental lighting system.

AKRON, OHIO.—Plans, it is reported, are being considered for equipping the Northern Ohio Railway for electrical operation from Akron to Greenwich.

CINCINNATI, OHIO.—The Cincinnati Gas & Electric Company has sold $4,500,000 in bonds, the proceeds of which, with the exception of $400,000, will be used for the erection of a new central electric generating station at Cincinnati.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, Cleveland, until April 25 for engine and turbine automatic control oiling and filter systems for the Division Avenue pumping station, department of public utilities, division of water. Specifications may be obtained at the office of the deputy commissioner of water, 413 Superior Avenue, City Hall.

HILLSBORO, OHIO.—The Public Utilities Commission has granted the Hillsboro, Cynthiana & Chillicothe Traction Company permission to issue $500,000 in capital stock and $1,300,000 in bonds, the proceeds to be used for the construction of an electric railway from Hillsboro to Chillicothe.

LORAINE, OHIO.—The Loraine Electric Light & Power Company, recently incorporated with a capital stock of $2,500, proposes to supply electricity for lamps and motors in Loraine. Bert Van Blair, A. Van Blair and W. R. Haistings are interested in the company.

OXFORD, OHIO.—The Board of Public Works has asked the Village Council for $4,500 for rehabilitation of the municipal electric-light plant. The cost of the proposed improvements is estimated at about $12,000.

HODGENVILLE, KY.—The Hodgenville Lighting Company has recently installed two 25-hp. oil engines and will install a new alternating-current generator. The company has boilers, engine and a 70-kw., 220-volt, direct-current dynamo for sale cheap. C. L. Herin is president.

LEXINGTON, KY.—Improvements and extensions are contemplated by the Lexington Utilities Company, including addition to boiler room (about 34 ft. by 70 ft.), installation of one 500-hp. boiler and stoker, one feed water heater. The company has recently ordered two 500-kva. transformers, 4000/33,000 volts. J. P. Pope is electrical engineer.

COLUMBUS, IND.—The board of directors of the Bartholomew County Fair and Racing Association has decided to install a lighting system on the fair grounds, power for which will be furnished by a gasoline engine. Joseph Houk is secretary of the association.

ROCHESTER, IND.—The Rochester Electric Light, Heat & Power Company is planning to erect a 4600-volt single-phase transmission line to Fulton, a distance of 9 miles, using No. 6 bare copper wire, to furnish electrical service there. Charles A. Davis is superintendent.

GENESEO, ILL.—The installation of a municipal electric-light plant is under consideration by the city officials.

SHERRARD, ILL.—D. W. Bowen, proprietor of the Sherrard electric-light system, expects to erect 10 miles of 4400-volt transmission line this summer.

SPRINGFIELD, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, until May 2 for construction of buildings and improvements at State institutions as follows: One new cottage for patients and also two new cottages for tubercular patients to be erected at the Peoria State Hospital at South Bartonville. Separate bids will be received for the general work, plumbing, heating and electrical work for each building. One employees' building to be erected at the St. Charles School for Boys, near St. Charles. Separate bids to be submitted for the general work, plumbing, heating and electrical work. (These bids are in lieu of bids rejected on account of insufficient appropriation.) Remodeling brick barn into laundry at Soldiers' Widows' Home of Illinois, near Wilmington, Ill. Separate bids will be received for general work, plumbing, heating and electrical work. Lighting and power wiring at the Alton State Hospital, near Alton. Plans and specifications for each of the above named improvements may be obtained upon written application to James B. Dibelka, state architect, 130 North Fifth Avenue, Chicago, upon deposit of $10.

MAIDEN ROCK, WIS.—The citizens of Maiden Rock are considering a proposal from the Wisconsin-Minnesota Light & Power Company of Eau Claire to extend its transmission line to this city.

PRAIRIE FARM, WIS.—The local electric-light plant and grist mill were recently destroyed by fire, causing a loss of about $15,000.

WILLIAMS BAY, WIS.—Bids will be received by S. B. Barrett, clerk of board of education, Williams Bay, until May 1, for construction of school building. Separate bids to be submitted on electric wiring and plumbing. Plans and specifications are on file in the office of the clerk and may be obtained from Chandler & Park, architects, of Racine, upon deposit of $5.

ARLINGTON, MINN.—The Consumers Power Company of Faribault is contemplating the erection of a transmission line to Le Seuer and Henderson, thence to Gaylord and Arlington.

BRAINERD, MINN.—Bids will be received at the office of the county auditor of Crow Wing County, Court House, Brainerd, until May 2 for construction of a county jail and sheriff's residence at Brainerd, including general contract work, jail cell work, heating, plumbing and electrical work, in accordance with plans and specifications prepared by Alden & Harris, architects, Commerce Building, St. Paul. Separate bids to be submitted on each portion of the work. Plans are on file at the St. Paul, Minneapolis and Duluth Builders' Exchanges and at the office of the county auditor, Brainerd, and at the office of the architect. Copies may be obtained upon application to the architects upon deposit of $10. C. D. Mahlum is county auditor.

BROWN VALLEY, MINN.—The Otter Tail Company of Fergus Falls, it is reported, contemplates the construction of a large steam power plant to replace the one recently destroyed by fire. The proposed plant will supply energy in Beardsley, Sisseton, Peever and Wilmot.

FERGUS FALLS, MINN.—Plans are being considered by the Otter Tail Power Company of Fergus Falls for construction of an addition to the power house at Hoot Lake and installation of a 1000-kw. generating unit.

FISHER, MINN.—The Red River Power Company of Grand Forks, N. D., has been granted a franchise to construct and oper-

ate an electric distributing system and street-lighting apparatus in Fisher.

VIRGINIA, MINN.—A committee has been appointed by the Commercial Club to confer with the Village Board of Franklin relative to the installation of an ornamental lighting system on Chestnut Street, between the Mesaba and Iron Range depots. A. G. Flourney is chairman of committee.

CEDAR RAPIDS, IOWA.—Work has begun on the construction of the new power house for the Iowa Railway & Light Company in Cedar Rapids, to be erected on North First Street.

DAVENPORT, IOWA.—Bids will be received by the supervising architect, Treasury Department, Washington, D. C., until May 15 for the installation complete of a hoistway, hydraulic freight lift, etc., in the United States post office and court house at Davenport, Iowa. For details see proposal columns.

DIAGONAL, IOWA.—The Council is considering the installation of a municipal electric-lighting system.

DUNLAP, IOWA.—The Missouri Valley Company has applied for a franchise to supply electricity in Dunlap.

IDA GROVE, IOWA.—The Ida Grove Electric Company has awarded contract for a 16-in. by 36-in. Murray Corliss engine. R. C. Clifton is manager.

MASON CITY, IOWA.—Bids will be received until May 10 for the construction of a nine-story office building for the Modern Brotherhood of America to be erected at the corner of Michigan and State Streets, Mason City, in accordance with plans and specifications prepared by Bell & Bentley, architects, Security Building, Minneapolis, Minn. Separate proposals will be received at the same time for heating, electric work, elevators, plumbing and terra cotta work. Plans and specifications may be seen at the office of E. L. Balz, supreme secretary, Mason City and at the office of the architects, in Minneapolis.

CRANE, MO.—The Lawrence County Water, Lighting & Cold Storage Company of Aurora has applied to the City Council for a franchise to supply electricity in Crane.

ST. LOUIS, MO.—Bids will be received at the office of the supervising architect, Washington, D. C., until April 26 for installing exterior lighting fixtures for the United States Custom House at St. Louis, Mo. For further information address the supervising architect.

LEMMON, S. D.—The light and power department of the Security Investment Company of Lemmon has been purchased by E. F. Sheets. The new owner is planning to establish a 24-hour service.

REDFIELD, S. D.—The proposal to issue $60,000 in bonds for rebuilding and enlarging the municipal electric-light plant is under consideration.

MERNA, NEB.—Bonds to the amount of $9,000 have been voted for improvements to the electric-light plant and water-works system.

MINATARE, NEB.—The Intermountain Railway, Lighting & Power Company of Scotts Bluff is planning to erect an electric transmission line to Minatare to furnish electrical service here.

SYRACUSE, NEB.—Plans are being prepared by the Martz Engineering Company, First National Bank Building, Lincoln, for the installation of a municipal electric light plant, to cost about $12,000.

DIGHTON, KAN.—At an election to be held May 16 the proposal to issue $28,000 in bonds for construction of electric-light plant and water-works system will be submitted to the voters. W. B. Rollins & Company, Midland Building, Kansas City, Mo., are engineers.

FORT SCOTT, KAN.—Plans are being prepared by G. W. Stiles, Bryant Building, and E. M. Stevens, Commerce Building, Kansas City, Mo., engineers, for a combined electric-light plant and water-works system, including filtration plant. J. O. Brown is city clerk.

INMAN, KAN.—The United Water, Gas & Electric Company of Hutchinson is planning to extend its transmission line to Inman to furnish electrical service here.

MORAN, KAN.—The city of Moran is contemplating the installation of an electric-light plant. It is proposed to secure energy from the Wichita Gas & Electric Company to operate the system.

PALCO, KAN.—The installation of a municipal electric-light plant and water works system in Palco is under consideration.

STERLING, KAN.—The Morris Electrical Power Company of Sterling is contemplating the installation of a 120-hp. De La Vergne engine and a 120-kva. General Electric generator, directly connected. C. H. Love is manager.

Southern States

CLEARWATER, FLA.—Preparations are being made for the erection of a brick building for the electric-light plant and ice factory for the Clearwater Lighting Company. W. G. Eager of Valdosta, Ga., is general manager.

OCALA, FLA.—The contract for the construction of a combined electric-light and water plant has been awarded to the Benjamin Thompson Company, at $97,254. Twombley & Henney, 55 Liberty Street, New York, N. Y., are engineers.

LIVINGSTON, TENN.—The Livingston Light & Power Company is planning to install a hydroelectric plant on Roaring River, 6 miles from Livingston. The initial installation provides for a development of 75 kw. The transmission line will carry either 6600 or 11,000 volts and will supply electricity in Livingston and perhaps later in Monroe. Contracts for electric equipment have been awarded. May award contracts for construction of dam, flume and power house. S. O. Kennedy is general manager.

BIRMINGHAM, ALA.—At an election to be held June 5 the proposal to issue $500,000 in bonds for the construction of an electric-light plant will be submitted to the voters.

BIRMINGHAM, ALA.—President Peaver of Birmingham Railway, Light & Power Company has submitted a proposal to the City Commission offering to sell the lamps, brackets and other fixtures used for lighting the city streets and to sell energy to maintain the street lamps at the same rate given other large consumers. This proposition was made by the company following the proposal of the city to substitute tungsten lamps for arc lamps over a large part of the city.

FORT PAYNE, ALA.—The engine and boiler in the local plant of the Alabama Power & Light Company was recently destroyed by an explosion.

ARKANSAS CITY, ARK.—Improvements are contemplated to the plant of the Lambe & Denmarke Light & Water Company, which will include the installation of a 120-hp. crude oil engine, one 100-kw. generator and accessories for same; 1000 lb. of wire, electric meter and centrifugal pumps of from 300 to 400 gal. per minute capacity; motor to drive pump and some 6-in. cast-iron pipe. The cost of work is estimated at $20,000.

BENTONVILLE, ARK.—Plans are being prepared by Albert C. Moore, engineer, Frisco Building, Joplin, Mo., for the installation of a municipal electric-light plant, to cost about $20,000.

LITTLE ROCK, ARK.—Preparations are being made by the Little Rock, Pine Bluff & Eastern Traction Company for the construction of an electric railway from Argenta and Little Rock to Pine Bluff, a distance of 45 miles.

MORRILLTON, ARK.—The Arkansas Light & Power Company is planning to rebuild its local system and will erect a transmission line to Plumerville soon. J. F. Mullins is local manager.

NEWPORT, ARK.—The Arkansas Light & Power Company is planning to rebuild its local plant and lines at once.

PARAGOULD, ARK.—The Arkansas Light & Power Company is installing three 200-hp. Brownell boilers in its local plant and will install a turbine soon. E. T. Reynolds is local manager.

HOWE, OKLA.—The City Council is considering submitting to the voters the proposal to issue $100,000 in bonds for the installation of a municipal electric light plant and water-works system.

MOORELAND, OKLA.—Plans are being considered for the installation of a municipal electric-light plant, to cost about $10,000.

NEW WILSON, OKLA.—Bonds to the amount of $25,000 have been voted for the installation of a municipal electric-light plant and water-works system.

COMANCHE, TEX.—The property of the Comanche Light & Power Company has been purchased by the Texas Power & Light Company. The local system will be connected by a high-tension line with the Texas company's generating station in Brownwood.

DALLAS, TEX.—The lighting franchise which was approved by the voters at a recent election provides that the lighting system should be capitalized at $3,485,964, plus whatever new money is put in the system, and that not less than $1,000,000 shall be expended in extensions and improvements within the next 18 months. The traction franchise which was approved at the same election provides that the four street railways in Dallas shall be combined with a capitalization of $4,790,124, plus any new money put into the properties, and that not less than $1,000,000 shall be expended in extensions and improvements within the next 18 months.

KNOX CITY, TEX.—The Haskell (Tex.) Light & Ice Company is erecting an electric high-tension transmission line from Haskell to Knox City, a distance of 42 miles, to supply electricity here.

MARBLE FALLS, TEX.—A new turbine is needed for the plant of the Marble Falls Water & Power Company. M. M. Berry is lessee.

SAN DIEGO, TEX.—A new electric light company, capitalized at $10,000, has recently been organized to install a plant in San Diego. A site has already been purchased.

Pacific States

BAKER, ORE.—The City Commissioners have proposed that the business men and property owners lend financial assistance in the installation of cluster lamps on certain streets. The Commercial Club is interested in the movement.

OREGON CITY, ORE.—Plans are being prepared by the Rasmussen-Grace Company, Bates Building, Portland, for the new power plant of the Hawley Pulp & Paper Company at Oregon City. The power station will be erected in the Oregon City side of the Willamette River just below the falls.

PORTLAND, ORE.—The General Electric Company, Portland office, it is reported, has secured a contract for electric generators, motors and other electrical equipment to be installed in the Black Butte quicksilver mines, near Cottage Grove, Ore.

LOS ANGELES, CAL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 8 for a vacuum cleaning machine for the United States post office and court house, Los Angeles, Cal.

NOVATO, CAL.—Bids for the installation of a new street-lighting system, in Novato, is reported to be under consideration.

RIVERSIDE, CAL.—Application has been filed by Charles H. De Lacorn, representing a company of eastern and northern capitalists, which proposes to erect a transmission line from Temecula through Fallbrooke, Oceanside and Escondido, for a franchise extending from Elsinore to the San Diego County line via Wildomar, Temecula and Murrietta. The company will be capitalized at $500,000. Connection will be made with the Southern Sierras Power Company at Elsinore.

SAN FRANCISCO, CAL.—The California-Oregon Power Company of San Francisco has applied to the State Railroad Commission for permission to supply electricity in Trinity County. The transmission line now extends as far as Castella, Shasta County, from which point it is desired to extend through Carrville to Trinity Center.

SAN FRANCISCO, CAL.—Plans for the proposed substation for the City Electric Company, to be erected on Bush Street, near Grant Avenue, have been filed with the building bureau of the Board of Public Works. The building will be of fireproof construction (68 ft. by 137 ft.) and will cost about $90,000. Plans were prepared by P. W. Ham, engineer, 14 Sansome Street, San Francisco.

HAILEY, IDAHO—The Silver Creek Power Company has applied to the Public Utilities Commission for permission to install an electric plant and furnish electrical service in Carey and Picabo. The cost of plant is estimated at $8,000.

SPRING CITY, UTAH.—Application has been filed by the municipality of Spring City with W. D. Beers, state engineer, for 6 cu. ft. per second from Oak Creek. It is proposed to develop the power for use in connection with a municipal electric-light plant.

CHOTEAU, MONT.—All bids submitted for the installation of an electric-lighting system in Choteau, it is reported, have been rejected. The bids were considered too high.

HINSDALE, MONT.—The town of Hinsdale has petitioned the Board of Commissioners of Valley County for the creation and establishment of a special water and light improvement district. It is proposed to install an electric generating plant, electric distributing system and water-works system, to cost about $27,700.

HYSHAM, MONT.—Plans are being considered by the Town Council for the installation of an electric-light plant and water-works system for which bonds were recently voted.

RED LODGE, MONT.—Surveys are being made for the proposed electric rail-

way to be built between Red Lodge and Columbus, via Bear Creek, a distance of 40 miles. D. E. Thompson of Lincoln, Neb., is interested.

CLOVIS, N. M.—Bonds to the amount of $35,000 have been voted for improvements to electric-light plant, water-works and sewer system. Burns & McDonnell, Kansas City, Mo., are consulting engineers.

MAGDALENA, N. M.—The property of the Magdalena Electric Light Company is reported to have been purchased by George Keith and Edward Wayne of Scorro. The new owners, it is understood, will make improvements to the system.

Canada

CALGARY, ALTA.—Bids will be received at the office of J. M. Miller, city clerk, Calgary, until April 27 for furnishing underground pot heads, junction boxes (switchboard type), knife switches and storage battery material. Specifications may be seen at the office of the city electrical engineer, Calgary.

EMERSON, MAN.—The Town Council is reported to have awarded the contract for the installation of an electric-lighting system in Emerson to the Dodge County Power Company of Hayfield, Minn.

ST. JOHN, N. B.—Plans are being considered by the Bay of Fundy Tide Power Company, recently incorporated, for the installation of a hydroelectric power plant at Cape Split. The present plans provide for an initial development of 10,000 hp, but provision will be made for future development. George B. Cutting of Arcadia, N. S., is president.

APPIN, ONT.—The installation of an electric-lighting system is under consideration by the Village Council.

BEDFORD MILLS, ONT.—The Bedford Mills Electric Company of Newboro contemplates the installation of an electric plant to cost about $6,000. R. P. Tett is manager.

GRAND VALLEY, ONT.—A by-law authorizing an expenditure of $11,000 for the installation of an electrical distributing system in Grand Valley has been approved by the ratepayers.

FORT DOVER, ONT.—The Town Council is contemplating securing electrical service from the Toronto Hydro-Electric Commission.

SAULT STE. MARIE, ONT.—Tenders will soon be asked by the City Council for the erection of a power and pumping station on Gore Street, to cost about $7,500. A. E. Pickering is city engineer.

TORONTO, ONT.—Underground conduit work, to cost about $85,000, is contemplated by the Toronto Hydro-Electric Commissioners.

WEYBURN, SASK.—A by-law has been approved by the rate payers authorizing an issue of $35,000 in debentures for extension of the civic electric-light plant.

Miscellaneous

PANAMA—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until April 24 for furnishing steel induction motors, Mazda lamps, leather belting, etc. Blanks and general information relating to this circular (No. 1035) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y., and 614 Whitney-Central Building, New Orleans, La.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until May 4 for furnishing staybolt iron, wrought-iron or steel pipe, bronze bars, copper wire, cable clips, electric turntable mule, fusible plugs, spark plugs, steam whistles, steam gages, grease cups, oil cups, steam gage lamps, etc. Blanks and general information relating to this circular (No. 1034) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

Record of Electrical Patents

Notes on United States Patents issued April 4, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,178,497. ELECTRIC REGULATION; John L. Creveling, New York, N. Y. App. filed Nov. 5, 1910. Charging storage batteries.

1,178,501. ELECTROLYTIC CELL; H. M. Du Bois, Detroit, Mich. App. filed April 11, 1910. For continuous electrolysis.

1,178,503. FIRE-ALARM BOX PROTECTOR; J. F. Eder, Baltimore, Md. App. filed June 25, 1915. Operation of alarm illuminates vicinity of box; key used with finger-print surface.

1,178,507. WIRELESS SIGNALING; R. A. Fessenden, Washington, D. C. App. filed Dec. 14, 1904. Current flux interact one upon the other.

1,178,510. ELECTRIC IGNITING DEVICE FOR GAS BURNERS; De F. P. Fuller, Denver, Col. App. filed March 12, 1915. Particularly for cooking ranges.

1,178,511. PROTECTOR FOR TELEPHONES, ETC.; J. E. Fullmer and E. L. Bullis, Kilbourn, Wis. App. filed Sept. 20, 1915. Automatic grounding construction.

1,178,539. INSULATOR; F. Schaub, Jersey City, N. J. App. filed Dec. 14, 1911. Pair of interchangeable half-cleats.

1,178,542. ELECTRICAL GAS LAMP; F. Skaupy, Berlin, Germany. App. filed Sept. 11, 1913. Has a cathode chamber of special formation.

1,178,561. KEY SOCKET; B. C. Webster, Bridgeport, Conn. App. filed Sept. 8, 1914. Switch mechanism incased between porcelain blocks.

1,178,576. ELECTRIC REGULATION; J. L. Creveling, New York, N. Y. App. filed June 21, 1911. Regulating shunt circuit for battery charging.

1,178,584. CIRCUIT CONTROLLER; C. T. Henderson, Milwaukee, Wis. App. filed April 14, 1913. Includes a resistance element.

1,178,587. METHOD OF MAKING INSULATING JOINTS; F. E. Layman, Milwaukee, Wis. App. filed April 19, 1915. Molds connecting members in insulation and then adds an inclosing shell.

1,178,591. ELECTROLYTIC CELL; F. J. Metzger, New York, N. Y. App. filed Oct. 16, 1908. Has a diaphragm formed of fibrous material.

1,178,596. GOVERNING DEVICE; P. Okey, Columbus, Ohio. App filed Jan. 2, 1912. Particularly for engine-driven dynamos. (Fifty-one claims.)

1,178,703. PNEUMATICALLY OPERATED ELECTRICAL SWITCH; J. F. Bentz and J. A. Sertl, Schenectady, N. Y. App. filed Nov. 19, 1914. Switch operated by distant fluid compressor.

1,178,713. PROTECTIVE APPARATUS FOR ELECTRICAL INSTRUMENTS; J. T. Greene, Toledo, Ohio. App. filed March 2, 1914. Includes an evacuated vessel.

1,178,753. DIRECT SERVICE ONE-POINT CONTROL DUMBWAITER; H. and B. Rowntree, Kenilworth, Ill. App. filed April 8, 1914. Dumbwaiter must return to starting-point before it can be sent elsewhere.

1,178,771. ROTOR FOR DYNAMO ELECTRIC MACHINES; A. Zehrung and R. Rudenberg, Berlin, Wilmersdorf, and Berlin, Germany. App. filed Jan. 9, 1915. Has separate axial channels and individual radial discharge openings.

1,178,772. ELECTRICAL MEASURING INSTRUMENT; J. G. Zimmerman, Milwaukee, Wis. App. filed Feb. 23, 1911. Special coil opposes movement of pointer.

1,178,777. ELECTRICAL HEATING DEVICE; P. F. Apfel, Seattle, Wash. App. filed Oct. 5, 1915. Adapted to be inserted into an ordinary hot-water tank.

1,178,792. ELECTRICAL SWITCH; L. W. Flack, Toledo, Ohio. App. filed Aug. 13, 1914. Quick make and break pull switch.

1,178,797. METAL PUNCHING MECHANISM; J. K. Graham and G. Rasmussen, Roanoke, Va. App. filed June 12, 1915. Automatic multiple punches.

1,178,822. ELECTRICALLY DRIVEN VEHICLE; R. Schlaepfer, Winterthur, Switzerland. App. filed Sept. 14, 1914. Internal combustion engine operates generator for the driving motors.

1,178,873. DIRECTION SIGNAL FOR AUTOMOBILES; E. Potter, Rochester, N. Y. App. filed March 22, 1915. Lamps are caused to "blink."

1,178,878. TELEGRAPHY AND TELEPHONY BY SUBMARINE CABLES, LONG DISTANCE OVERHEAD LINES, AND THE LIKE; J. Schiessler, Baden, near Vienna, Austria-Hungary. App. filed Feb. 7, 1912. Includes an oscillatory member maintained in forced equilibrium.

1,178,879. ELECTROMAGNETIC TYPEWRITER; J. Schnyder, Kriens, near Lucerne, Switzerland. App. filed Jan. 27, 1913. Has automatic carriage return and line spacer controlled by keys.

1,178,882. ELECTRICAL RECEIVING APPARATUS; T. N. Slocum, Aberdeen, Wash. App. filed Aug. 13, 1915. Employs a selenium cell.

1,178,883. ELECTRIC STOVE; T. N. Slocum, Aberdeen, Wash. App. filed Aug. 13, 1915. Portable and collapsible construction.

1,178,890. RADIOTELEGRAPHY STATION; Graf Georg von Arco, August Leib and August Frey, Nonnendamm, near Berlin, Germany. App. filed Nov. 1, 1911. Improved switching mechanism.

1,178,905. INTENSIFIER FOR SPARK PLUGS; E. F. Cogley, Omaha, Neb. App. filed July 9, 1915. Auxiliary spark gap attachable to spark plugs.

1,178,927. GALVANIC CELL; M. L. Kaplan, Brooklyn, N. Y. App. filed Aug. 14, 1913. Subjects manganese compound to dry oxidation and then oxidizes wet.

1,178,928. FLASHLIGHT; M. L. Kaplan, Brooklyn, N. Y. App. filed Nov. 24, 1914. Special case and switch construction.

1,179,030. COIL SEPARATOR; E. R. Pearson, Pittsfield, Mass. App. filed Nov. 8, 1912. Provides for supporting all coils without obstructing cooling fluid.

1,179,107. THERMAL CIRCUIT BREAKER; J. M. Johnson, Kansas City, Kan. App. filed July 2, 1913. Includes a plug provided with a bell-shaped apron.

1,179,108. INDICATING SWITCH; W. Kaisling, Chicago, Ill. App. filed July 26, 1913. Indicates manner in which switch last actuated.

1,179,109. DIMMER SWITCH FOR LIGHTING CIRCUITS; W. Kaisling, Chicago, Ill. App. filed Oct. 25, 1913. Push-button-operated switch with resistance incorporated.

1,179,117. TELEPHONE; E. D. Lowry, Philadelphia, Pa. App. filed April 16, 1915. Includes an auxiliary diaphragm with street connecting diaphragms.

1,179,127. INSULATOR; H. R. Markel, Columbus, Ohio. App. filed Jan. 9, 1914. Knob sections automatically lock together.

1,179,174. REFILLABLE CARTRIDGE FUSE; G. W. Goodridge, Bridgeport, Conn. App. filed Nov. 25, 1914. Fuse-clamping means holds end cap in position.

1,179,175. TELEPHONE SYSTEM; E. A. Graham, Brockley, London, England. App. filed March 31, 1914. Central energy loud-speaking system.

1,179,239. SYSTEM FOR CONVERTING DIRECT CURRENT INTO ALTERNATING CURRENTS OF DIFFERENT FREQUENCIES; P. Thalassinoz, Philadelphia, Pa. App. filed March 27, 1915. Works on principle of rotary converter.

1,179,260. AUTOMATIC CALL AND LIGHTING SYSTEM; R. L. Wood, Jr., and G. E. Crowley, Tallulah Lodge, Ga. App. filed Aug. 7, 1915. Controlled by clock mechanism.

1,179,276. FIRE-ALARM SYSTEM INCLUDING A THERMAL CIRCUIT CLOSER; C. S. Bullock, Stratford, Conn. App. filed Jan. 22, 1910. Closed main circuit with closed and open signal circuits.

1,179,293. SELECTIVE RELAY; F. L. Dodgson, Rochester, N. Y. App. filed Nov. 20, 1914. Particularly for highway crossing signals.

1,179,306. SIGNALING APPARATUS FOR VEHICLES; P. R. Harsh, Toledo, Ohio. App. filed May 28, 1915. Actuated by turning a steering wheel.

1,179,313. APPARATUS FOR TREATING ORES; E. R. Holden, Los Angeles, Cal. App. filed July 21, 1915. Tank with series of superposed blades therein.

1,179,353. WIRELESS TELEGRAPHY; L. F. Fuller, Palo Alto, Cal. App. filed April 21, 1913. Obtains a higher antenna current.

1,179,373. ELECTRICAL SYSTEM OF DISTRIBUTION; J. W. Jepson, Buffalo, N. Y. App. filed Feb. 15, 1916. Minimum apparatus battery charging system (fifty-eight claims).

1,179,380. HIGH-POTENTIAL ELECTRICITY ARRESTER; F. R. Parker, Chicago, Ill. App. filed July 29, 1908. Improved electrodes and dielectric (thirty-eight claims).

14,103 (reissued)—ELECTRIC LAMP SOCKET; G. W. Goodridge, Bridgeport, Conn. App. filed Nov. 23, 1915; original 1,121,348 dated Dec. 15, 1914. Multi-latch between shell and cap.

14,104 (reissued) . MOTOR CONTROL; W. P. Jackson, Oakland, Cal. App. filed Feb. 2, 1913; original 1,077,717, dated Nov. 4, 1913. Automatic control of field strength of d.c. series motors.